

Specification No. B27-13

City of Concord, New Hampshire

Purchasing Division

TAXIWAY CONSTRUCTION PROJECT CONCORD MUNICIPAL AIRPORT

71 Airport Road, Concord NH

State Block Grant Program No. SBG-04-08-2013

Prepared for, and in coordination with the

COMMUNITY DEVELOPMENT DEPARTMENT

ENGINEERING SERVICES DIVISION

APRIL 2013



Prepared by

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Bedford New Hampshire 03110

TABLE OF CONTENTS

Cover Sheet	
Table of Contents	i – iv
Invitation to Bid	A-1 – A-3

BIDDING REQUIREMENTS

Information for Bidders.....	I-1 – I-12
Proposal	P-1 – P-49
Bid Bond	BB-1 – BB-4

CONTRACT DOCUMENTS

Contract	C-1 – C-4
Contract Bonds	CB-1 – CB-8

<u>NOTICE TO PROCEED</u>	NTP-1 – NTP-2
--------------------------------	---------------

<u>NOTICE OF AWARD</u>	NOA-1 – NOA-2
------------------------------	---------------

<u>FAA PROVISIONS FOR AIP PROJECTS</u>	FAA-1 – FAA-16
--	----------------

<u>FEDERAL WAGE RATES</u>	FWR-1 – FWR-6
---------------------------------	---------------

CONTRACT ARTICLES

Section 10 – Definition of Terms	2 - 4
Section 20 – Proposal Requirements and Conditions	5 – 7
Section 30 – Award and Execution of Contract	8 – 10
Section 40 – Scope of Work	11 – 13
Section 50 – Control of Work	14 – 18
Section 60 – Control of Materials.....	19 – 21
Section 70 – Legal Regulations and Responsibility to Public.....	22 – 27
Section 80 – Prosecution and Progress.....	28 – 32
Section 90 – Measurement and Payment.....	33 – 38
Section 100 – Contractor Quality Control Program	39 – 44
Section 110 – Method of Estimating Percentage of Material within Spec. Limits	45 – 54
Section 120 – Nuclear Gauges.....	55 – 56

SUPPLEMENTAL CONTRACT ARTICLES

Section I – Contract Document Drawings.....	SCA-1 – SCA-2
Section II – Special Inspection Requirements.....	SCA-2
Section III – “Or Equal” Clause.....	SCA-2
Section IV – Protection of Lives and Health.....	SCA-3
Section V – Insurance.....	SCA-3 – SCA-4
Section VI – Special Hazards.....	SCA-4 – SCA-5
Section VII –Work Limitations (Noise).....	SCA-5 – SCA-6

TECHNICAL SPECIFICATIONS

Section G-001 – Summary of Work and Special Work Requirements	
Section G-002 – Record Documents	
Section M-001 – Mobilization, Engineer’s Field Office, and Safety and Phasing Items	
Section M-002 – Contractor’s Safety Plan Compliance Document	
Section M-003 – Sawed Control Joints	
Section M-004 – Pavement Milling	
Section M-005 – Lupine Transplanting	
Section M-006 – Pipe and Structure Cleaning	

Section P-151 – Clearing and Grubbing
 Section P-152 – Excavation and Embankment
 Section P-154 – Subbase Course
 Section P-156 – Temporary Air and Water Pollution, Soil Erosion and Siltation Control
 Section P-209 – Crushed Aggregate Base Course
 Section P-401 – Plant Mix Bituminous Concrete Top Course Pavement
 Section P-602 – Bituminous Prime Coat
 Section P-603 – Bituminous Tack Coat
 Section P-605 – Joint Sealing Filler
 Section P-606 – Adhesive Compounds, Two-component for Sealing Wire and Lights in Pavement
 Section P-610 – Structural Portland Cement Concrete
 Section P-620 – Runway and Taxiway Painting
 Section D-701 – Pipe for Storm Drains
 Section D-751 – Manholes, Catch basins, and Inlets
 Section F-162 – Fence and Gates
 Section T-901 – Seeding, Preparation of Seed Beds, and Mulch
 Section T-905 – Topsoil
 Section L-107 – Airport Wind Cone
 Section L-108 – Underground Power Cable for Airports
 Section L-109 – Airport Transformer Vault and Vault Equipment
 Section L-110 – Airport Underground Electrical Duct Banks and Conduits
 Section L-110A – Horizontal Directional Drilling
 Section L-115 – Electrical Junction Structures
 Section L-125 – Installation of Airport Lighting Systems
 Section 16050 – Electrical Requirements
 Section 16130 – Cabinets, Boxes, and Fittings
 Section 16195 – Electrical Identification
 Section 16450 – Grounding
 Section 16476 – Disconnect Switches and Circuit Breakers
 Geotechnical Report

SCHEDULE OF DRAWINGS

<u>Sheet No.</u>	<u>Drawing Name</u>	<u>Dwg. No.</u>
1.0	Title Sheet	1 of 77
1.1	General Plan	2 of 77
1.2	General Notes	3 of 77
2.0	Safety and Phasing Plan and Notes (1 of 3)	4 of 77
2.1	Safety and Phasing Plan and Notes (2 of 3)	5 of 77
2.2	Safety and Phasing Plan and Notes (3 of 3)	6 of 77
3.0	Existing Conditions Plan (1 of 4)	7 of 77
3.1	Existing Conditions Plan (2 of 4)	8 of 77
3.2	Existing Conditions Plan (3 of 4)	9 of 77
3.3	Existing Conditions Plan (4 of 4)	10 of 77
4.0	Erosion and Sediment Control Plan (1 of 2)	11 of 77
4.1	Erosion and Sediment Control Plan (2 of 2)	12 of 77
4.2	Erosion and Sediment Control Details and Notes (1 of 2)	13 of 77
4.3	Erosion and Sediment Control Details and Notes (2 of 2)	14 of 77
5.0	Demolition Plan (1 of 4)	15 of 77
5.1	Demolition Plan (2 of 4)	16 of 77
5.2	Demolition Plan (3 of 4)	17 of 77
5.3	Demolition Plan (4 of 4)	18 of 77
6.0	Typical Sections	19 of 77
6.1	Pavement Details	20 of 77
6.2	Conservation Area Plan	21 of 77
7.0	Geometry and Marking Plan (1 of 4)	22 of 77
7.1	Geometry and Marking Plan (2 of 4)	23 of 77
7.2	Geometry and Marking Plan (3 of 4)	24 of 77

7.3	Geometry and Marking Plan (4 of 4)	25 of 77
7.4	Marking Details	26 of 77
8.0	Taxiway Profiles (1 of 3)	27 of 77
8.1	Taxiway Profiles (2 of 3)	28 of 77
8.2	Taxiway Profiles (3 of 3)	29 of 77
9.0	Grading and Drainage Plan (1 of 4)	30 of 77
9.1	Grading and Drainage Plan (2 of 4)	31 of 77
9.2	Grading and Drainage Plan (3 of 4)	32 of 77
9.3	Grading and Drainage Plan (4 of 4)	33 of 77
9.4	Drainage Details (1 of 3)	34 of 77
9.5	Drainage Details (2 of 3)	35 of 77
9.6	Drainage Details (3 of 3)	36 of 77
10.0	Habitat Mitigation Tree Removal Plan	37 of 77
10.1	Habitat Mitigation Lupine Transplant Plan	38 of 77
10.2	Lupine Transplant Details	39 of 77
11.0	Fence Plan	40 of 77
11.1	Fence Details	41 of 77
12.0	Lighting and Signage Plan (1 of 4)	42 of 77
12.1	Lighting and Signage Plan (2 of 4)	43 of 77
12.2	Lighting and Signage Plan (3 of 4)	44 of 77
12.3	Lighting and Signage Plan (4 of 4)	45 of 77
12.4	Radio Control Replacement Plan	46 of 77
12.5	Electrical Vault Plan	47 of 77
12.6	Circuit Plan – Runway 12-30	48 of 77
12.7	Circuit Plan – Runway 17-35	49 of 77
12.8	Circuit Plan for PAPI	50 of 77
12.9	Circuit Plan – Taxiway A/B Phase 1	51 of 77
12.10	Circuit Plan – Taxiway A/B Phase 2	52 of 77
12.11	Electrical Details (1 of 6)	53 of 77
12.12	Electrical Details (2 of 6)	54 of 77
12.13	Electrical Details (3 of 6)	55 of 77
12.14	Electrical Details (4 of 6)	56 of 77
12.15	Electrical Details (5 of 6)	57 of 77
12.16	Electrical Details (6 of 6)	58 of 77
12.17	Sign Panel Replacement Plan	59 of 77
13.0	PAPI Details (1 of 6)	60 of 77
13.1	PAPI Details (2 of 6)	61 of 77
13.2	PAPI Details (3 of 6)	62 of 77
13.3	PAPI Details (4 of 6)	63 of 77
13.4	PAPI Details (5 of 6)	64 of 77
13.5	PAPI Details (6 of 6)	65 of 77
14.0	Cross Sections (1 of 12)	66 of 77
14.1	Cross Sections (2 of 12)	67 of 77
14.2	Cross Sections (3 of 12)	68 of 77
14.3	Cross Sections (4 of 12)	69 of 77
14.4	Cross Sections (5 of 12)	70 of 77
14.5	Cross Sections (6 of 12)	71 of 77
14.6	Cross Sections (7 of 12)	72 of 77
14.7	Cross Sections (8 of 12)	73 of 77
14.8	Cross Sections (9 of 12)	74 of 77
14.9	Cross Sections (10 of 12)	75 of 77
14.10	Cross Sections (11 of 12)	76 of 77
14.11	Cross Sections (12 of 12)	77 of 77

INVITATION TO BID
B27-13, Taxiway Construction Project
Concord Municipal Airport
SBG-04-08-2013

Sealed proposals for *B27-13, Taxiway Construction Project Concord Municipal Airport* which consists of constructing Taxiways B, B1, B2, A1 and a portion of Taxiway A; and installing Runway 12 PAPI will be received at the City of Concord, ("The OWNER"), Purchasing Division located at 311 North State Street, Concord, NH 03301, until 2:00 p.m., Friday, May 3rd, 2013 at which time and place they will be opened and publicly read. Bids received after the specified time will not be accepted.

The envelopes containing the bid must be sealed and plainly marked:

B27-13, Taxiway Construction Project Concord Municipal Airport

This project involves the following:

- Construction of approximately 4,300 linear feet of new taxiway
- Implementation of erosion control measures
- Tree clearing including grubbing
- Selective tree cutting
- Installation of storm drainage including catch basins, junction structures, RCP and HDPE pipe, underground infiltration basis, and a headwall with outlet protection
- Excavation, embankment construction and grading
- Stripping and processing of existing topsoil for reuse
- Construction of sub base and base courses
- Bituminous concrete pavement
- Installation of new taxiway edge lighting system and guidance signs
- Installation of new 2-box PAPI and supplemental wind cone
- Removal and installation/relocation of chain link fence
- Pavement markings
- Topsoil, seed, mulch, and erosion control blankets

A MANDATORY pre-bid informational meeting (attendance required for all prospective bidders) will be held at the City of Concord, City Hall, 2nd Floor Conference Room, 41 Green Street, Concord, NH 03301 at 1:00 p.m., Wednesday, April 17, 2013.

Invitations for Bids may be issued only by the Purchasing Manager, or his designee, to authorized firms, are not transferable, unless authorized by the Purchasing Manager, or his designee.

Complete copies of B27-13 may be obtained from the Purchasing Division, Combined Operations & Maintenance Facility, 311 N. State Street, Concord, NH 03301 (603-230-3664) or on-line at www.concordnh.gov/Purchasing. Electronic files (.pdf copies of the bid documents) may be obtained by request. Contact dross@concordnh.gov

The cost for bid documents will be free however a non-refundable charge of \$35 per set will be assessed if plans are requested by postal or overnight delivery.

All bids are advertised, at the City's discretion, in various publications and are posted publicly as detailed below:

<u>Name</u>	<u>Advertising Medium</u>	<u>Address</u>	<u>Phone/Fax</u>	<u>Email and Web Address</u>
City of Concord, NH	Posted on City Website and in City Hall Lobby	311 N. State Street, Concord NH 033301	603.225.8530 603.230.3656(fax)	purchasing@concordnh.gov www.concordnh.gov/purchasing
Associated General Contractors	Bid House	48 Grandview Drive, Bow NH 03304	603.225.2701 603.226.3859(fax)	plansroom@agcnh.org www.agcnh.org
Construction Summary of NH	Bid House	734 Chestnut St, Manchester NH 03104	603.627.8856 603.627.4524(fax)	info@constructionsummary.com www.constructionsummry.com
Bid Ocean	Bid House	PO Box 40445, Grand Junction, CO 81501	866.347.9657 877.356.9704(fax)	bids@bidocean.com www.bidocean.com
McGraw Hill Construction	Bid House	880 Second Street, Manchester NH 03102	603.645.6554 603.645.6714(fax)	una_taylor@mcgraw-hill.com www.construction.com
New England Construction News - CDC News	Bid House	100 Radnor Rd S-102, State College, PA 16801	1.800.652.0008 1.888.285.3393(fax)	plans@cdcnews.com www.cdcnews.com

All questions about the meaning or intent of the bidding documents are to be directed in writing or by email to the city purchasing department:

City of Concord Purchasing Department
Attn: Douglas B. Ross – Purchasing Manager
Combined Operations & Maintenance Facility
311 North State Street, Concord, NH 03301
dross@concordnh.gov

Interpretations or clarifications considered necessary by the CITY in response to such questions will be issued by Addenda delivered to all parties recorded by the CITY as having obtained a complete set of the Bidding Documents. **Questions received less than five (5) days prior to the date for opening of Bids may not be answered.** Only questions answered by formal written Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect. All bidders shall acknowledge all addenda with their bids.

Each bid shall be accompanied by a certified check, cash, check drawn by a New Hampshire bank, or bid bond for and subject to the conditions provided in the Instructions to Bidders. The amount of such bid deposit shall be **ten percent (10%)** of the total bid, made payable to the City of Concord, New Hampshire.

The successful bidder will be required to furnish a Performance Bond and a separate Payment Bond each in the amount of **one hundred percent (100%)** of the contract price.

The City of Concord reserves the right to reject any or all bids or any part thereof, to waive any formality, informality, information and/or errors in the bidding, to accept the bid considered to be in the best interest of the City, or to purchase on the open market if it is considered in the best interest of the City to do so.

Failure to submit all information as detailed in the Bid Submission Checklist, Proposal and/or submission of an unbalanced bid are sufficient reasons to declare a bid as non-responsive and subject to disqualification.

Progress Payments: On or about the last day of every month, the Contractor shall prepare and submit an invoice covering the total quantities of work which have been completed from the start of the job up to and including the last day of the preceeding month together with such supporting evidence as required by the City and/or Federal Aviation Administration and/or New Hampshire Department of Transportation.

Retainage: There is a ten percent (10%) retainage for this project. Retainage shall be held on all completed work until a final inspection has been executed, all deficiencies (if any) have been corrected, all required close out documents have been received, and the contractor has been notified in writing of the owners Final Acceptance of the project.

Liquidated Damages: If the work remains incomplete after the time as specified in the Information for Bidders, the Contractor shall pay the OWNER as liquidated damages the sum of five hundred dollars (\$500.00) plus engineering/inspection costs per day for each and every calendar day that the work remains incomplete beyond the specified time. Such sum is agreed upon not as a penalty, but as fixed and liquidated damages for each day of such delay, to be paid in full and subject to no deduction. If the payments due the Contractor are less than the amount of such liquidated damages said damages shall be deducted from any other monies due or to become due the Contractor or shall be paid by the Contractor's surety.

CITY OF CONCORD NEW HAMPSHIRE

Douglas B. Ross
Purchasing Manager

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INFORMATION FOR BIDDERS

1. Receipt and Opening of Bids

The City of Concord, ("The OWNER"), invites bids on the form attached hereto, all blanks of which must be appropriately filled in. Bids will be received by the City of Concord Purchasing Division, located at the Combined Operations & Maintenance Facility, 311 North State Street, Concord, NH 03301, until 2:00 p.m., Friday, May 3, 2013 at which time and place they will be opened and publicly read. Bids received after the specified time will not be accepted.

The envelopes containing the bid must be sealed, and plainly marked:

B27-13, Taxiway Construction Project Concord Municipal Airport

The OWNER may consider informal any bid not prepared and submitted in accordance with the provisions hereof and may waive any formality, informality, information and/or errors or reject any and all bids. Any bid may be withdrawn prior to the above scheduled time for the opening of bids or authorized postponement thereof. Any bid received after the time and date specified shall not be considered. No bidder may withdraw a bid **one-hundred eighty (180) calendar days** after the actual date of the opening thereof.

The Contractor's attention is called to Section 20-06 of the Contract Articles that requires all Bidders to examine the project site prior to submission of a proposal. The Contractor shall be familiar with all facets of the project. The Contract documents illustrate the project requirements with available information that is reasonable to include within the documents. Additional details required to accurately attribute a value for bidding the proposed work shall be gathered through conducting a site visit. Site visits shall be conducted at the pre-bid meeting or by arranging a time to visit the site with the OWNER [Attn: Martha Drukker, phone (603) 225-8520].

2. Description of Work

The project will consist of Constructing New Taxiways at Concord Municipal Airport, 71 Airport Road, Concord, NH 03301.

Elements of the project include but are not limited to the following:

- Construction of approximately 4,300 linear feet of new taxiway
- Implementation of erosion control measures
- Tree clearing including grubbing
- Selective tree cutting
- Installation of storm drainage including catch basins, junction structures, RCP and HDPE pipe, underground infiltration basis, and a headwall with outlet protection
- Excavation, embankment construction and grading
- Stripping and processing of existing topsoil for reuse
- Construction of sub base and base courses
- Bituminous concrete pavement
- Installation of new taxiway edge lighting system and guidance signs
- Installation of new 2-box PAPI and supplemental wind cone
- Removal and installation/relocation of chain link fence
- Pavement markings
- Topsoil, seed, mulch, and erosion control blankets

The project site is an active conservation area which is managed by the New Hampshire Fish and Game Department. The site is habitat for several threatened and endangered species including the wild lupine plant, the Karner Blue Butterfly and the Hog Nose Snake. The contractor shall adhere to the phasing plans and maintain his/her men and equipment within the designated work areas at all times.

The project includes requirements for the contractor to submit a Contractor's Safety Plan Compliance Document (CSPCD), a Stormwater Pollution Prevention Plan (SWPPP), US EPA Notice of Intent (NOI), US EPA Notice of Termination, and electrical permits. The Engineer has written and submitted the Construction Safety and Phasing Plan (CSPP), the Alteration of Terrain (AoT) Permit, and FAA Form 7460-1 Notice of Proposed Construction.

3. Preparation of Bid

Each bid must be submitted on the prescribed proposal form and must be accompanied by the signed Certifications, bid bond, acknowledgement of receipt of all addenda, and the DBE Letter of Intent included in the front pocket of the specifications. Each bid must be prepared in strict accordance with the requirements of Section 20 of the Contract Articles of these specifications. Any corrections to entries made on the bid forms shall be initialed by the person signing the bid. Bids must be typewritten or printed in ink. Bids must be mailed or delivered in person. Bids that are faxed or e-mailed will not be accepted.

Only proposals from prospective bidders who have obtained a complete set of bid documents will be accepted.

Bidders must quote on all items appearing on the bid forms unless specific directions in the advertisement, on the bid form or in the special provisions allowed for partial bids. Failure to quote on all items may disqualify the bid. When bids on all items are not required, bidders shall insert the words "no bid" where appropriate.

Alternative bids will be considered, unless otherwise stated, only if the alternate is:

- (1) Described completely, including, but not limited to, sample(s), if requested, and specifications sufficient so that a comparison to the request can be made; and
- (2) Submitted as part of the base bid response, i.e. it shall not be a separate document which could be construed as a second bid.

Unless otherwise stated in the Invitation for Bids, prices quoted shall remain firm for the period **one-hundred eight (180) calendar days** after the date and time for receipt of bids.

Any questions or inquiries must be submitted in writing, and must be received by the OWNER no later than five (5) calendar days before the Request for Bids due date to be considered. Any changes to the Request for Bids will be provided to all bidders of record.

The bidder shall not divulge, discuss or compare his/her bid with other bidders and shall not collude with any other bidder of parties to a bid whatever. (Note: No premiums, rebates or gratuities permitted either with, prior to, or after any delivery materials is allowed. Any such violation will result in the cancellation and/or return of materials, as applicable, and the removal from Bid List).

The name of manufacturer, trade name, or catalog number mentioned in this request for bids description is for the purpose of designating a minimum standard of quality and type. Such references are not intended to be restrictive, although specified color, type of material and specified measurements may be mandatory. Proposals will be considered for any brand that meets or exceeds the quality of the specifications listed. On all such proposals, the bidder shall specify the product they are proposing and shall supply sufficient data to enable a comparison to be made with the particular brand or manufacturer specified. Failure to submit the above may be sufficient grounds for rejection of the proposal.

When samples are required, they must be submitted free of cost and will be returned unless otherwise specified.

Items left for demonstration purposes shall be delivered and installed free of charge and shall be removed by the vendor at no cost to the OWNER. Said demonstration units shall not be offered to the OWNER as new equipment unless mutually agreed to.

The vendor may be required to supply proof of compliance with bid specifications. When requested, the vendor must immediately supply the OWNER with certified test results or certificates of compliance. Where none are available, the OWNER may require independent laboratory testing. All costs for such testing, certified test results or certificates of compliance, shall be the responsibility of the vendor.

Unless otherwise stated, all prices are F.O.B.: Destination. No charge for packing or drayage will be allowed. All deliveries are to be pre-paid, C.O.D.'s will not be accepted. All items, packages, etc. shall have clearly identifiable external markings or tags for ease of identification.

4. Subcontracts

The bidder is specifically advised that any person, firm, or other party to whom it is proposed to award a subcontract under this Contract:

- a. Must be acceptable to the OWNER and the New Hampshire Department of Transportation, and
- b. Must submit Certification by Proposed Subcontractor Regarding Equal Employment Opportunity. Approval of the proposed subcontract award cannot be given by the OWNER unless and until the proposed subcontractor has submitted the Certification and/or other evidence showing that it has fully complied with any reporting requirements to which it is or was subject. Although the bidder is not required to attach such Certification by proposed subcontractors to his/her bid, the bidder is here advised of this requirement so that appropriate action can be taken to prevent subsequent delay in subcontract awards.

5. Bidder's Qualifications

Any individual, partnership, or corporation which has been disqualified by the State of New Hampshire from acting as prime contractor or subcontractor on State projects shall be disqualified from acting as the prime Contractor or Subcontractor on this Project.

Any individual, partnership, or corporation which has been disqualified by the City of Concord from acting as prime contractor or subcontractor on State projects shall be disqualified from acting as the prime Contractor or Subcontractor on this Project.

Said firms may act as material suppliers in accordance with the decisions of the State of New Hampshire.

Any individual, partnership, or corporation which has been disqualified by the Federal Government as listed on the Excluded Parties List (<https://www.epls.gov/>) from acting as prime contractor or subcontractor on Federal projects shall be disqualified from acting as the prime Contractor or Subcontractor on this Project.

The Owner may make such investigations as it deems necessary to determine the ability of the bidder to perform the work. The bidder shall furnish to the Owner such information and data for this purpose as the Owner may request. The Owner reserves the right to reject any bid if the evidence submitted by, or investigation of such bidder fails to satisfy the Owner that such bidder is properly qualified to carry out the obligations of the contract and to complete the work contemplated therein. Conditional bids will not be accepted.

6. Method of Award

The owner reserves the right to reject any or all proposals for any reason the owner deems advisable. Award of contract will be made by the City upon the recommendation of the Engineer to the lowest, eligible, responsive bidder meeting the requirements of the Owner, the Federal Aviation Administration, and the State of New Hampshire.

The contract will be awarded to the bidder with the lowest qualified bid for the Base Bid plus Additive Alternate 1 plus Additive Alternate 2.

Funding for the Base Bid (Phase 1) is anticipated to be available between September-October 31, 2013. As such bidders may not withdraw bids for a period of one hundred eighty (180) calendar days after the bid opening.

Further, funding for Additive Alternate 1(Phase 2) and Additive Alternate 2 (Phase 3) is not anticipated to be available until September-October 2014. As such, by executing a contract for the base bid work the successful bidder shall agree to hold all unit prices until October 31, 2014. The contractor's attention is directed to Section 41-Pricing of the Information For Bidders.

It is the City's intent to execute a contract with the successful bidder for the base bid work. Such execution is anticipated to occur between September - October 2013. Upon execution of the contract the contractor shall begin work on the Base Bid (Phase 1). Upon completion of Phase 1 a winter shut down is anticipated.

Providing the contractor's performance on the Base Bid (Phase 1) is acceptable to the City AND sufficient additional funding is secured; the City intends to execute a second contract (or change order) to the contractor for Additive Alternate 1 (Phase 2) and Additive Alternate 2 (Phase 3) to be constructed in the fall of 2014/spring of 2015. Such contract (or Change Order) is anticipated to be executed on or about September - October 2014.

7. Proposal Guaranty Bid Security

Each bid must be accompanied by certified check of the bidder, cash, or a bid bond prepared on the form of bid bond included in the Contract Documents, duly executed by the bidder as principal and having as surety thereon a surety company approved by the Owner, in the amount of 10% of the bid. The bid bond shall be executed or countersigned for the surety by a person who has current power of attorney for the surety.

The bid security will be returned to all except the three lowest bidders as soon as possible after the opening of bids, and the remaining checks or bid bonds will be returned promptly after the Owner and the accepted bidder have executed the Contract, or, if no award has been made **one hundred eighty (180) calendar days** after the date of the opening of bids, upon demand of the bidder at any time thereafter, so long as he has not been notified of the acceptance of his/her bid.

8. Time of Completion and Liquidated Damages

The Owner will issue a written "Notice-to-Proceed" which will specify an effective date for the Contractor to commence work.

The bidder must agree to commence work by the date to be specified in the written "Notice to Proceed" from the Owner, and to fully complete the project within the following time tables:

Base Bid: 60 Calendar Days
Additive Alternate 1: 75 Calendar Days
Additive Alternate 2: 30 Calendar Days

The Contractor will be assessed liquidated damages in the sum of **one thousand dollars (\$1,000.00) plus inspection/engineering costs** per day for each and every calendar day that the project remains incomplete beyond the designated durations from the Notice To Proceed Date(s).

9. Security for Faithful Performance

Simultaneously with his/her delivery of the executed Contract, the successful bidder shall furnish surety bonds (Payment and Performance Bonds) as security for faithful performance of this Contract and for the payment of all persons performing labor on the project under this contract and furnishing materials in connection with this Contract, as specified in the Contract Articles included herein. The bonds shall be of the form provided hereinafter and shall be executed by surety acceptable to the Owner and licensed to do business in the State of New Hampshire. The bonds shall be executed by or countersigned by an agent for surety said agent to have current power of attorney for the surety. Each bond shall be in the amount of 100% of Contract awarded.

10. Addenda and Interpretations

No interpretation of the meaning of the plans, specifications or other pre-bid documents will be made to any bidder orally.

Any questions or inquiries must be submitted in writing, and must be received by the **OWNER** no later than **five (5) calendar days** before the Invitation to Bid due date to be considered. Refer to the Invitation to Bid for the proper addresses. Any changes to the Invitation to Bids will be provided to all bidders of record who have obtained the project manual. Any and all such interpretations and any supplemental instructions will be in the form of written addenda to the specifications which, if issued, will be e-mailed to all prospective bidders (at the respective address furnished for such purposes), not later than **twenty-four (24) hours** prior to the date and time fixed for the opening of bids. Addenda will be issued by e-mail which will require return acknowledgement of receipt by the bidder, via email. Failure of any bidder to receive any such addendum or interpretation shall not relieve such bidder from any obligation under his/her bid as submitted. All addenda so issued shall become part of the Contract Documents.

11. Power of Attorney

Attorneys-in-fact who sign bid bonds or contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.

12. Laws and Regulations

The bidder's attention is directed to the fact that all applicable Federal and State laws, municipal ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the Contract throughout, and they will be deemed to be included in the Contract the same as though herein written out in full.

13. Execution of Contract

The individual, firm, partnership, or corporation to whom or to which the Contract has been awarded shall sign the necessary agreements entering into a Contract with the OWNER and return them to the Office of the OWNER (with the required contract bonds and insurance certificates) within **ten (10) calendar days** after the Contract is mailed. The OWNER may request insurance certificates prior to the Contract award in order to obtain necessary State of New Hampshire approvals.

14. Approval of Contract

Approval of the Contract shall be in accordance with Section 30 of the Contract Articles.

The successful Bidder shall return the executed agreements and the appropriate Contract Bonds and Insurance Certificates to the Owner within ten (10) calendar days of mailing, as specified above. The Owner shall then execute the agreements within **fourteen (14) calendar days** of the receipt of the Bidder's executed copy of the Contract. The Contract is subject to the New Hampshire Department of Transportation (NHDOT) approval.

The Contract does not become binding until both the successful Bidder and the Owner sign it and it has been approved by NHDOT. At that time, and at that time only, does the Contract become binding on all parties. At this point the Contract is considered fully executed.

15. Failure to Execute Contract

Failure of a bidder to comply with any of the requirements of the proposal, failure to execute the Contract within **ten (10) calendar days** after mailing, as specified, or failure to furnish contract bonds as required shall be just cause for the annulment of the award. In the event of such annulment of the award, the amount of bid security shall become the property of the Owner, not as a penalty but as fixed and agreed liquidated damages. Award may then be made to the next best qualified bidder, or the work readvertised, or otherwise handled as the Owner may elect.

16. Notice of Special Conditions

Attention is particularly called to those parts of the Contract Documents and specifications that deal with the following:

- a. Inspection of work.
- b. Insurance requirements.
- c. Wage rates.
- d. Scheduling the contract work.
- e. Liquidated damages for failure to complete the various portions of the work within the specified times.

17. Employment of Women

Women will be afforded equal opportunity in all areas of employment. However, the employment of women shall not diminish the standards or requirements for the employment of minorities.

18. Equal Employment Opportunity

- a. Each bidder will be required to comply with the affirmative action plan for equal employment opportunity prescribed by the OFCC, United States Department of Labor, Regulations of the Secretary of Labor (41 CFR 60), or by other designated trades used in the performance of the contract and other nonfederally involved contracts in the area geographically defined in the plan.
- b. The proposed contract is under and subject to Executive Order 11246 of September 26, 1965, as amended, and to the equal opportunity clause; and

- c. The successful bidder will be required to submit a Certification of Nonsegregated Facilities prior to award of the contract, and to notify prospective subcontractors of the requirement for such a certification where the subcontract exceeds \$10,000. Samples of the certification and the notice to subcontractors appear in the specifications.
- d. When a determination has been made to award a contract or subcontract to a specific contractor, such contractor is required, prior to the award or after the award, or both, to furnish such other information as the FAA, the sponsor, or the Director of OFCC requests.
- e. A bidder must indicate whether he/she has previously had a contract subject to the equal opportunity clause, whether he has filed all report forms required in such contract, and if not, compliance report (Standard Form (SF) 100) must be submitted with his/her bid.
- f. Equal Employment Opportunity (EEO) and labor provisions, when applicable, are included in the bidding documents of specifications.
- g. Contractors and subcontractors may satisfy EEO requirements of paragraph 2 of the EEO contract clause by stating in all solicitations or advertisements for employees that: "All qualified applicants will receive consideration for employment without regard to race, color, sex, or national origin." or by using a single advertisement in which appears in clearly distinguished type, the phrase:

"an equal opportunity employer."
- h. A contractor having 50 or more employees and his/her subcontractors having 50 or more employees and who may be awarded a subcontract of \$50,000 or more will, within 120 days from contract commencement, be required to develop a written affirmative action compliance program for each of its establishments (state and local governments are exempt).

19. Withdrawal of Bids

Bids may be withdrawn prior to the opening date and time upon written, faxed, e-mailed or telegraphic request of the bidder to the OWNER. Negligence on the part of the bidder in preparing his/her bid shall not constitute a right to withdraw bid subsequent to the bid opening. Bids may not be withdrawn **one hundred eighty (180) calendar days** after the date of opening indicated herein or as modified by addenda.

20. Bidders Interested In More Than One Bid

If more than one bid is offered by any one party, or by any person or persons representing a party, all such bids shall be rejected. A party who has quoted prices to a bidder is not thereby disqualified from quoting prices to other bidders or from submitting a direct bid in his/her own behalf.

21. Receipt And Opening Of Bids

Bids shall be submitted prior to the time fixed in the Invitation for Bids. Bids received after the time so indicated shall be returned unopened. Bids must be mailed via the United States Postal Service or commercial carrier or delivered in person. Bids that are faxed or e-mailed will not be accepted. At the time and place fixed for opening bids, the contents of all bids will be made public for the information of all bidders and other interested parties who may be present in person or by representative.

22. Bid Results

Bidders may secure information pertaining to the results of a bid by emailing the OWNER or by going on-line at www.concordnh.gov/purchasing.

NO TELEPHONE REQUESTS FOR RESULTS WILL BE ACCEPTED OR GIVEN.

23. Tie Bids

If a tie bid exists between two bidders, the decision may be made by a toss of coin.

24. Award of Contract

The contract may be awarded to the lowest responsive and responsible bidder as soon as practical after the bid opening unless otherwise stated, but generally not before funding is secured. It is requested that interested parties refrain from making inquiries during this period.

It is the policy of the OWNER that contracts be awarded only to responsive and responsible bidders. In order to qualify as responsive and responsible, a prospective bidder must meet the following standards as they relate to this request:

- Have adequate financial resources for performance or have the ability to obtain such resources as required during performance;
- Have the necessary experience, organization, technical and professional qualifications, skills and facilities;
- Be able to comply with the proposed or required time of completion or performance schedule;
- Have a demonstrated satisfactory record of performance; and
- Adhere to the specifications of this bid and provide all documentation required of this bid.

The OWNER reserves the right to waive any formality, informality, information and/or errors in the bids submitted and the right to reject any or all bids at its discretion and to accept the bid which will be in the best interest of the OWNER; or to purchase on the open market if it is considered in the best interest of the OWNER to do so. Failure to submit all information called for and/or submission of an unbalanced bid are sufficient reasons to declare a bid as nonresponsive and subject to disqualification. In an attempt to determine if a bidder is responsible, the OWNER, at its discretion may obtain technical support from outside sources. Each bidder will agree to fully cooperate with the personnel of such organizations. In case of error in the extension of prices, the unit prices bid shall govern and the unit prices in writing shall take precedence over the unit prices in figures. Also, in the event of a discrepancy between the total of the items and the lump sum total stated, the total of the items shall govern.

25. Limitations

This bid document does not commit the OWNER to award a contract, to pay any costs incurred in the preparation of the bid response, or to procure or contract for goods, services, equipment or supplies. The OWNER reserves the right to accept or reject any or all bids received as a result of this request, or to cancel in part or in its entirety this bid document, if it is in the best interests of the OWNER to do so.

26. Cancellation of Award

The OWNER reserves the right to cancel the award without liability to the bidder, except for the return of the bid bond, at any time before a contract has been fully executed by all parties and is approved by the OWNER.

27. Modifications after Award

The OWNER reserves the right to incorporate minor modifications that may be required by it. The Vendor will incorporate these changes at no additional cost, but may protest such action and not be bound by any such request if it can prove that the timing or extent of the modifications implies a major effort on its part.

28. Return of the Bid Bond

All bid bonds, except that of the selected bidder, will be returned after the OWNER has awarded a contract. The successful bidder's bond will be returned as soon as an agreement has been fully executed.

29. Requirements of Surety Bonds

At the time of the execution of the agreement, the successful bidder shall furnish the OWNER with surety bonds, which have been fully executed by the bidder, guaranteeing the performance of the work and the payment of all legal debts that may be incurred by reason of the Contractor's performance of the work. The surety and the form of the bonds shall be acceptable to the OWNER. Unless otherwise specified, the surety bonds shall be in the sum equal to the full amount of the agreement.

30. Disqualification

Awards will not be made to any person, firm and/or corporation that has defaulted upon a contract with the City, the State of New Hampshire or the Federal Government within the past 5 years. Awards will not be made to any principal

owner or officers that have a 10% or greater interest in a firm or corporation that has defaulted upon a contract with the City, the State of New Hampshire or the Federal Government within the past 5 years. Corporations must currently be in good standing with the Secretary of State's Office in the state of incorporation.

31. Safety Data Sheet (Right to Know)

Any vendor who receives an order resulting from this invitation agrees to submit a Material Safety Data Sheet (MSDS) for each toxic or hazardous substance or mixture containing such substance, pursuant to RSA 277-A when deliveries are made. The vendor agrees to deliver all containers properly labeled pursuant to RSA 277-A. Failure to submit an MSDS and/or label on each container will place the vendor in noncompliance with that purchase order. Failure to submit MSDS and/or labels on each container may result in civil or criminal penalties, including bid debarment and action to prevent the vendor from selling said substances, or mixtures containing said substances within the State. All vendors furnishing substances or mixtures subject to RSA 277-A are cautioned to obtain and read the law referenced above.

32. Patent Protection

The seller agrees to indemnify and defend the OWNER from all claims and losses resulting from alleged and actual patent infringements and further agrees to hold the OWNER harmless from any liability arising under RSA 382-A, 2-312 (3). (Uniform Commercial Code).

33. Assignment Provision

The contractor/vendor hereby agrees that it will assign to the OWNER all cause of action that it may acquire under the anti-trust laws of New Hampshire and the United States as the result of conspiracies, combination of contracts in restraint of trade which affect the price of goods or services obtained by the OWNER under this contract if so requested by the OWNER.

34. Invoicing

Unless otherwise stated, invoices are to be submitted in duplicate upon delivery or pick-up to the user department or division. The invoice must include an itemization of all items, supplies, repairs or labor furnished, including unit list price, net price, extensions and total amount due. In addition, on projects that will involve partial payments and/or retainage a summary statement in the following format will be provided with each invoice:

Original Contract Amount	\$\$\$\$\$\$\$\$
Plus/minus Change Orders	\$\$\$\$\$\$\$\$
Total Adjusted Contract Amount	\$\$\$\$\$\$\$\$
Work Completed to Date	\$\$\$\$\$\$\$\$
Less Previous Invoice	\$\$\$\$\$\$\$\$
Less Retainage (if any)	\$\$\$\$\$\$\$\$
Equals: Balance due this Invoice	\$\$\$\$\$\$\$\$
Balance Remaining on Contract	\$\$\$\$\$\$\$\$

All invoices shall included the OWNER contract number. Invoice format is subject to the OWNER approval.

35. Progress Payments and Retainage

Progress Payments: On not later than the last day of every month, the vendor shall prepare and submit an invoice covering the total quantities of work that have been completed from the start of the job up to and including the last day of the preceding month together with such supporting evidence as required by the OWNER.

- a. Retainage: Retainage shall be 10 percent (**10%**). 10 percent of each partial payment amount will be deducted and retained by the OWNER until Final Acceptance and the final payment is made. See Contract Articles specification section 90-06, Partial Payments.

36. Payment

Unless otherwise stated, payment will be made within thirty (30) days of the completion of delivery of all items or service, in acceptable condition, to the OWNER and receipt of invoice, whichever is later.

37. Tax

The OWNER is exempt from all sales and Federal excise taxes. Please bill less these taxes

38. Funding Out

The Owner's obligations to pay any amount due under a contract are contingent upon availability and continuation of funds for the purpose. The OWNER may terminate the contract, for non-appropriation of funds, and all payment obligations of the OWNER cease on the date of termination.

39. Assignment or Sub-Contracting

None of the work or services covered by the contract shall be assigned in full or in part, or subcontracted without the prior approval of the OWNER.

40. Exclusivity

This contract will be for the goods/services described above; however, this agreement should not be considered exclusive. As deemed necessary, the OWNER reserves the right to obtain these goods/services from any other vendor.

41. Pricing

Unless otherwise specified all prices listed are firm for the term of the contract. All prices should include all labor and material costs, and any discounts offered. Fuel adjustment, escalation charges, or other types of surcharges will not be allowed during the term of the contract.

42. Audit

It is the responsibility of the vendor to make available at his/her place of business upon demand, all price lists and other records pertaining to purchases made under the contract for the purposes of audit by the OWNER.

43. Inspection & Evaluation

The OWNER reserves the right to inspect the vendor's facilities during operating hours to determine that the level of inventory is adequate for the OWNER's needs. The conditions and operations of the facility shall be taken into consideration in making the award of this contract.

44. Guarantees & Warranty

All parts and labor related to agreements must be guaranteed and include a warranty. If any work is unable to be guaranteed, the contractor must inform the OWNER, in writing, prior to the delivery of an item or any work being performed. Non-guaranteed work must be offered at a discount rate from the bid prices. **Inspection, testing and final determination of nonwarranty work shall be performed at no cost to the OWNER.**

45. Force Majeure

Neither party shall be liable for any inability to perform its' obligations under any subsequent agreement due to war, riot, insurrection, civil commotion, fire, flood, earthquake, storm or other act of God.

46. Notification

Notification of the parties shall be considered to have been constructively received when it is mailed via the United States Postal Service or delivered in hand to the parties as stated in the contract.

47. Severability

If any of the GENERAL TERMS AND CONDITIONS is held to be invalid or unenforceable, it will be construed to have the broadest interpretation which would make it valid and enforceable under such holding. Invalidity or unenforceability of a term or condition will not affect any of the other GENERAL TERMS AND CONDITIONS.

48. Definitions

Bid shall also mean quotation, proposal, offer, qualification/experience statement, and services. Bidders shall also mean vendors, officers, or any person or firm responding to a request for bids.

49. Governing Law

All contracts entered into by the OWNER shall be governed by the Laws of the State of New Hampshire. Any disputes shall be resolved within the venue of the State of New Hampshire and Merrimack County.

50. Provisions Required by Law Deemed Inserted

Each and every provision and clause required by law to be inserted in any contract shall be deemed to be inserted and the contract shall be read and enforced as though it were included herein, and if through mistake or otherwise any such provision is not inserted, or is not correctly inserted, then upon the application of either part, the contract shall forthwith be physically amended to make such insertion or correction.

51. Insurance

The successful bidder shall procure and maintain insurance, in the amounts and coverage detailed by the bid documents, acceptable to the OWNER, at the bidder's sole expense, with reputable and financially responsible insurance companies, insuring against any and all public liability, including injuries or death to persons and damage to property, arising out of or related to the goods or bidder's performance hereunder and shall furnish to the OWNER certificates of such insurance and renewals thereof signed by the issuing company or agent upon the OWNER's request. Such certificates shall name the OWNER as an additional insured. Such policies shall provide for cancellation only subsequent to 30 days prior written notice to the OWNER.

The OWNER's examination of, or failure to request or demand, any evidence of insurance hereunder, shall not constitute a waiver of any requirement and the existence of any insurance shall not limit the bidder's obligation under any provision hereof.

Except to the extent of comparable insurance acceptable to, or express waiver by the OWNER, the bidder shall, or shall cause any carrier engaged by the bidder, to insure all shipments of goods for full value.

If the agreement with the bidder involves the performance of work by the bidder's employees at property owned or leased by the OWNER, the bidder shall furnish such additional insurance as the OWNER may request in respect thereof, but in any event and without such request, workers' compensation insurance and unemployment compensation insurance as required by laws of the State of New Hampshire and public and automotive liability and property damage insurance. In no event shall such employees of the bidder be deemed to be the employees of, or under the direction or control of the OWNER for any purpose whatsoever.

52. Contract

The contract between the OWNER and the Contractor shall consist of (1) the bid documents and any amendments there to and (2) the Contractor's bid. In the event of a conflict in language between documents (1) and (2) referenced above, the provisions and requirements set forth and referenced in the bid documents shall govern. However, the OWNER reserves the right to clarify any contractual relationship in writing with the concurrence of the Contractor and such written clarification shall govern in case of conflict with the applicable requirements contained in the bid documents and the Contractor bid. In all other matters, not affected by written clarification, if any, the bid documents shall govern. The bidder is cautioned that his/her bid shall be subject to acceptance without further clarification.

53. Disagreements and Disputes

All disagreements and disputes, if any, arising under the terms of any agreement, either by law, in equity, or by arbitration, shall be resolved pursuant to the laws and procedures of the State of New Hampshire, in which state any agreement shall be deemed to have been executed. No action at law, or equity or by arbitration shall be commenced to resolve any disagreements or disputes under the terms of any agreement, in any jurisdiction whatsoever other than the State of New Hampshire and Merrimack County.

54. Termination of Contract for Cause

If through any cause, the Contractor shall fail to furnish, in a timely and proper manner, its obligations under any contract, or if the Contractor shall violate any of the covenants, agreements or stipulations of any contract, the OWNER shall thereupon have the right to terminate any contract by giving written notice to the Contractor of such termination and specifying the effective date thereof at least five (5) days before the effective date of such termination. In such event, all finished or unfinished work, documents, plans, data programs and reports prepared by the Contractor under any contract shall, at the option of the OWNER, become its property and the Contractor shall be entitled to receive just and equitable compensation for any satisfactory work completed. Notwithstanding the above, the Contractor shall not be relieved of liability to the OWNER for damages sustained by the OWNER by virtue of any breach of the contract, and the OWNER may withhold any payments until such time as the exact amount of damages due the OWNER is determined.

55. Termination of Contract for the Convenience of the OWNER

The OWNER may terminate any contract at any time by giving written notice to the Contractor of such termination and specifying the effective date thereof, at least fifteen (15) days before the effective date of such termination.

In that event, all finished or unfinished work, documents, plans, data programs and reports prepared by the Contractor under any contract shall, at the option of the OWNER, become its property and the Contractor shall be entitled to receive just and equitable compensation for any satisfactory work completed.

56. Bid Evaluation

In an attempt to determine if a bidder is responsible, the OWNER, at its discretion, may obtain technical support from outside sources. Each bidder will agree to fully cooperate with the personnel of such organizations.

57. Worker's Compensation

All bidders and subcontractors at every tier under the bidder will conform with the requirements of RSA 281 Title XXIII, Section 281-A:2 with close attention to sections VI(a), VI(c) and VII(a) as well as Section 281-A:4.

58. Ownership of Reports

All data, materials, plans, reports and documentation prepared pursuant to any contract between the OWNER and the successful bidder shall belong exclusively to the OWNER.

59. Fugitive Dust and Noise Ordinances

All work shall be conducted in conformance with Title I, General Code

1. Chapter 11, Public Nuisances, Article 11-3 Fugitive Dust: and
2. Chapter 13, Public Health, Article 13-6 Noise

The contractor shall control the creation of dust by applying water and shall limit noise as may be reasonable or proper to avoid undue nuisance.

60. Energy Star® Compliance

The vendor shall provide products that earn the Energy Star® and meet the Energy Star® specifications for energy efficiency. The vendor is encouraged to visit www.energystar.gov for complete product specifications and updated lists of qualifying products.

61. RSA 277:5-a

Effective 7/1/08 any person/vendor signing a contract to work on a construction, reconstruction, alteration, remodeling, installation, demolition, maintenance, or repair of any public work or building for the OWNER with a total project cost of \$100,000 or more must be in compliance with RSA 277:5-a.

62. Disadvantaged Business Enterprises

The OWNER hereby notifies all bidders that it will affirmatively insure that in any contract entered into pursuant to this Invitation for Bids, disadvantaged business enterprises will be afforded full opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, national origin, religion, sex, age or disability in consideration for an award.

63. Non-Discrimination

Contracts for work resulting from this Invitation for Bids shall obligate the Contractor and the Subcontractors not to discriminate in employment practices on the grounds of race, color, national origin, religion, sex, age or disability. Statements as to non-discriminatory practices may be requested from the successful bidder(s).

64. Contract Award Protest Policy and Procedure

The City's Contract Award Protest Policy and Procedure can be viewed on-line at www.concordnh.gov/Purchasing.

PROPOSAL DOCUMENT

Taxiway Construction Project

at the

Concord Municipal Airport
71 Airport Road
Concord, NH 03301

STATE BLOCK GRANT PROGRAM
SBG-04-08-2013

May 2013

Note: The Bidder shall complete and submit the attached documents in a sealed envelope designated as:

B27-13, Taxiway Construction Project Concord Municipal Airport

PROPOSAL
Taxiway Construction Project
Concord Municipal Airport
SBG-04-08-2013

Proposal of _____,
hereinafter called ("Bidder") a corporation*, organized under the laws of the State of
_____, a partnership*, or an individual* doing
business as _____; to the
THE CITY OF CONCORD NEW HAMPSHIRE (hereinafter called "Owner").

Ladies/Gentlemen:

The Bidder, in compliance with your invitation for bids for the construction of airport improvements having examined the plans and specifications with related documents and the site of the proposed work, and being familiar with all of the conditions surrounding the construction of the proposed project including the availability of materials, and labor, hereby proposes to furnish labor, materials, and supplies, and to construct the project in accordance with the Contract Documents, within the time set forth therein, and at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the Contract Documents, of which this proposal is a part.

Time of Completion and Liquidated Damages

The bidder must agree to commence work on or before a date to be specified in the written Notice to Proceed of the Owner and to fully complete the project within the following durations:

Base Bid: 60 calendar days
Additive Alternate 1: 75 Calendar Days
Additive Alternate 2: 30 Calendar Days

Bidder must agree to pay to the Owner as liquidated damages the sum of one thousand dollars (\$1,000.00) plus inspection/engineering costs for each and every calendar day the work remains incomplete beyond the above specified time.

Bidder acknowledges receipt of the following addenda:

Bidder agrees to perform all the work described in the specifications, shown on the plans or directed, for the following unit prices:

**Taxiway Construction Project
Base Bid Unit Price Form**

ITEM NO.	ESTIMATED QUANTITY	ITEM DESCRIPTION AND UNIT PRICE BID WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			DOLLARS	CENTS	DOLLARS	CENTS
G-002-1	1 LS	<u>As-Built Plans</u> _____ Dollars (words) and _____ Cents. Per Lump Sum				
M-001-1	1 LS	<u>Mobilization – Base Bid</u> _____ Dollars (words) and _____ Cents. Per Lump Sum				
M-001-4	1 LS	<u>Engineer's Field Office – Base Bid</u> _____ Dollars (words) and _____ Cents. Per Lump Sum				
M-001-7	1 LS	<u>Safety and Phasing Items – Base Bid.</u> _____ Dollars (words) and _____ Cents. Per Lump Sum				
M-002-1	1 LS	<u>Contractor's Safety Plan Compliance Document</u> _____ Dollars (words) and _____ Cents. <u>Per Lump Sum</u>				

Taxiway Construction Project Base Bid Unit Price Form

ITEM NO.	ESTIMATED QUANTITY	ITEM DESCRIPTION AND UNIT PRICE BID WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			DOLLARS	CENTS	DOLLARS	CENTS
M-003-1	990 LF	<u>Sawed Control Joints</u> _____ Dollars (words) and _____ Cents. <u>Per Linear Foot</u>				
M-004-1	3,250 SY	<u>Pavement Milling</u> _____ Dollars (words) and _____ Cents. <u>Per Square Yard</u>				
M-005-1	12,700 SF	<u>Transplant Blue Lupine</u> _____ Dollars (words) and _____ Cents. <u>Per Square Foot</u>				
P-151-1	0.6 AC	<u>Clearing-On Airport</u> _____ Dollars (words) and _____ Cents. <u>Per Acre</u>				
P-151-2	1.6 AC	<u>Clearing-Off Airport</u> _____ Dollars (words) and _____ Cents. <u>Per Acre</u>				

**Taxiway Construction Project
Base Bid Unit Price Form**

ITEM NO.	ESTIMATED QUANTITY	ITEM DESCRIPTION AND UNIT PRICE BID WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			DOLLARS	CENTS	DOLLARS	CENTS
P-151-3	5.1 AC	<u>Clearing and Grubbing</u> _____ Dollars (words) and _____ Cents. <u>Per Acre</u>				
P-151-4	8 EA	<u>Select Tree Clearing: 0-24" diameter</u> _____ Dollars (words) and _____ Cents. <u>Per Each</u>				
P-152-1	8,700 CY	<u>Unclassified Excavation</u> _____ Dollars (words) and _____ Cents. <u>Per Cubic Yard</u>				
P-152-3	90 LF	<u>Drainage Pipe Removal</u> _____ Dollars (words) and _____ Cents. <u>Per Linear Foot</u>				
P-152-4	1 EA	<u>Headwall Removal</u> _____ Dollars (words) and _____ Cents. <u>Per Each</u>				

**Taxiway Construction Project
Base Bid Unit Price Form**

ITEM NO.	ESTIMATED QUANTITY	ITEM DESCRIPTION AND UNIT PRICE BID WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			DOLLARS	CENTS	DOLLARS	CENTS
P-152-7	200 LF	<u>Direct Buried Cable Removal</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Linear Foot</u>				
P-152-10	1,400 LF	<u>Fence Removal</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Linear Foot</u>				
P-152-11	2 EA	<u>Relocate Habitat Delineation Marker</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Each</u>				
P-152-12	5,700 CY	<u>Embankment in Place</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Cubic Yard</u>				
P-154-1	3,850 CY	<u>Subbase Course</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Cubic Yard</u>				

**Taxiway Construction Project
Base Bid Unit Price Form**

ITEM NO.	ESTIMATED QUANTITY	ITEM DESCRIPTION AND UNIT PRICE BID WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			DOLLARS	CENTS	DOLLARS	CENTS
P-156-1	3,675 LF	<u>Silt Fence</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Linear Foot</u>				
P-156-2	1,020 LF	<u>Coir Log Sediment Barrier</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Linear Foot</u>				
P-156-3	30 LF	<u>Coir Log Sediment Berm</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Linear Foot</u>				
P-156-4	1 EA	<u>Construction Exit</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Each</u>				
P-156-5	750 SY	<u>Erosion Control Blanket</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Square Yard</u>				

Taxiway Construction Project
Base Bid Unit Price Form

ITEM NO.	ESTIMATED QUANTITY	ITEM DESCRIPTION AND UNIT PRICE BID WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			DOLLARS	CENTS	DOLLARS	CENTS
P-156-6	10 EA	<u>Inlet Protection</u> <div style="text-align: right;">_____ Dollars</div> <div>(words)</div> <div>and _____ Cents.</div> <u>Per Each</u>				
P-156-7	1 LS	<u>Erosion and Sediment Control and Stormwater Management Plan</u> <div style="text-align: right;">_____ Dollars</div> <div>(words)</div> <div>and _____ Cents.</div> <u>Per Lump Sum</u>				
P-209-1	1,600 CY	<u>Crushed Aggregate Base Course</u> <div style="text-align: right;">_____ Dollars</div> <div>(words)</div> <div>and _____ Cents.</div> <u>Per Cubic Yard</u>				
P-401-1	2,500 TON	<u>Plant Mix Bituminous Pavements</u> <div style="text-align: right;">_____ Dollars</div> <div>(words)</div> <div>and _____ Cents.</div> <u>Per Ton</u>				
P-602-1	4,600 GAL	<u>Bituminous Prime Coat</u> <div style="text-align: right;">_____ Dollars</div> <div>(words)</div> <div>and _____ Cents.</div> <u>Per Gallon</u>				

**Taxiway Construction Project
Base Bid Unit Price Form**

ITEM NO.	ESTIMATED QUANTITY	ITEM DESCRIPTION AND UNIT PRICE BID WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			DOLLARS	CENTS	DOLLARS	CENTS
P-603-1	1,450 GAL	<u>Bituminous Tack Coat</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Gallon</u>				
P-620-1	4,925 SF	<u>Permanent Paint Markings</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Square Foot</u>				
D-701-1	215 LF	<u>12 Inch Reinforced Concrete Pipe (Class V)</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Linear Foot</u>				
D-701-2	215 LF	<u>12 Inch Perforated HDPE Pipe</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Linear Foot</u>				
D-701-3	345 LF	<u>36 Inch Reinforced Concrete Pipe (Class V)</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Linear Foot</u>				

**Taxiway Construction Project
Base Bid Unit Price Form**

ITEM NO.	ESTIMATED QUANTITY	ITEM DESCRIPTION AND UNIT PRICE BID WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			DOLLARS	CENTS	DOLLARS	CENTS
D-701-4	450 LF	<u>36 Inch Diameter Perforated HDPE Pipe</u> <div style="text-align: right;">_____ Dollars</div> <div>(words)</div> <div>and _____ Cents.</div> <u>Per Linear Foot</u>				
D-751-1	5 EA	<u>6 Foot Diameter Manhole</u> <div style="text-align: right;">_____ Dollars</div> <div>(words)</div> <div>and _____ Cents.</div> <u>Per Each</u>				
D-751-2	2 EA	<u>4 Foot Diameter Catch Basin</u> <div style="text-align: right;">_____ Dollars</div> <div>(words)</div> <div>and _____ Cents.</div> <u>Per Each</u>				
D-751-3	2 EA	<u>6 Foot Diameter Catch Basin</u> <div style="text-align: right;">_____ Dollars</div> <div>(words)</div> <div>and _____ Cents.</div> <u>Per Each</u>				
D-751-4	1 EA	<u>Headwall</u> <div style="text-align: right;">_____ Dollars</div> <div>(words)</div> <div>and _____ Cents.</div> <u>Per Each</u>				

**Taxiway Construction Project
Base Bid Unit Price Form**

ITEM NO.	ESTIMATED QUANTITY	ITEM DESCRIPTION AND UNIT PRICE BID WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			DOLLARS	CENTS	DOLLARS	CENTS
D-751-5	4 EA	<u>Adjust Existing Structure to Grade</u> <div style="text-align: right;">_____ Dollars</div> <div>(words)</div> <div>and _____ Cents.</div> <u>Per Each</u>				
L-107-1	1 EA	<u>8 Foot Wind Cone, in place</u> <div style="text-align: right;">_____ Dollars</div> <div>(words)</div> <div>and _____ Cents.</div> <u>Per Each</u>				
L-108-1	6,025 LF	<u>No. 8 AWG L-824C Cable, installed in duct bank or conduit-per linear foot</u> <div style="text-align: right;">_____ Dollars</div> <div>(words)</div> <div>and _____ Cents.</div> <u>Per Linear Foot</u>				
L-108-3	5,000 LF	<u>Bare Counterpoise Wire, installed in trench, duct bank or conduit, including ground rods and ground connectors – per linear foot</u> <div style="text-align: right;">_____ Dollars</div> <div>(words)</div> <div>and _____ Cents.</div> <u>Per Linear Foot</u>				
L-110-1	410 LF	<u>Concrete-Encased Electrical Duct Bank, 1Way-2" Schedule 40 PVC</u> <div style="text-align: right;">_____ Dollars</div> <div>(words)</div> <div>and _____ Cents.</div> <u>Per Linear Foot</u>				

**Taxiway Construction Project
Base Bid Unit Price Form**

ITEM NO.	ESTIMATED QUANTITY	ITEM DESCRIPTION AND UNIT PRICE BID WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			DOLLARS	CENTS	DOLLARS	CENTS
L-110-2	50 LF	<u>Concrete-Encased Electrical Duct Bank, 2Way-4" Schedule 40 PVC</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> and _____ Cents. <u>Per Linear Foot</u>				
L-110-3	4,325 LF	<u>Electrical Conduit, 2" Schedule 40 PVC, Direct Buried</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> and _____ Cents. <u>Per Linear Foot</u>				
L-115-1	2 EA	<u>Electrical Handhole, 4'x4'x4'</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> and _____ Cents. <u>Per Each</u>				
L-125-1	7 EA	<u>L-861T Taxiway Edge Light, base mounted, infield</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> and _____ Cents. <u>Per Each</u>				
L-125-2	6 EA	<u>L-861T Taxiway Edge Light, base mounted, existing pavement</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> and _____ Cents. <u>Per Each</u>				

**Taxiway Construction Project
Base Bid Unit Price Form**

ITEM NO.	ESTIMATED QUANTITY	ITEM DESCRIPTION AND UNIT PRICE BID WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			DOLLARS	CENTS	DOLLARS	CENTS
L-125-3	35 EA	<u>L-861T Taxiway Edge Light, stake mounted</u> <div style="text-align: right;">_____ Dollars</div> <div>(words)</div> <div>and _____ Cents.</div> <u>Per Each</u>				
L-125-4	2 EA	<u>L-852T Taxiway In-Pavement Omnidirectional Light, base mounted</u> <div style="text-align: right;">_____ Dollars</div> <div>(words)</div> <div>and _____ Cents.</div> <u>Per Each</u>				
L-125-5	1 EA	<u>L-858 1-Module, Size 1 Guidance Sign</u> <div style="text-align: right;">_____ Dollars</div> <div>(words)</div> <div>and _____ Cents.</div> <u>Per Each</u>				
L-125-6	2 EA	<u>L-858 2-Module, Size 1 Guidance Sign</u> <div style="text-align: right;">_____ Dollars</div> <div>(words)</div> <div>and _____ Cents.</div> <u>Per Each</u>				
L-125-7	4 EA	<u>L-858 3-Module, Size 1 Guidance Sign</u> <div style="text-align: right;">_____ Dollars</div> <div>(words)</div> <div>and _____ Cents.</div> <u>Per Each</u>				

**Taxiway Construction Project
Base Bid Unit Price Form**

ITEM NO.	ESTIMATED QUANTITY	ITEM DESCRIPTION AND UNIT PRICE BID WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			DOLLARS	CENTS	DOLLARS	CENTS
F-162-1	1,430 LF	<u>Chain-Link Fence</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> and _____ Cents. <u>Per Linear Foot</u>				
F-162-2	1 EA	<u>Chain-Link Vehicle Gate</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> and _____ Cents. <u>Per Each</u>				
T-901-1	20,125 SY	<u>Conservation Habitat Seed</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> and _____ Cents. <u>Per Square Yard</u>				
T-901-2	750 SY	<u>Slope Seed</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> and _____ Cents. <u>Per Square Yard</u>				
T-901-3	20,875 SY	<u>Wood Fiber Mulch</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> and _____ Cents. <u>Per Square Yard</u>				

**Taxiway Construction Project
Base Bid Unit Price Form**

ITEM NO.	ESTIMATED QUANTITY	ITEM DESCRIPTION AND UNIT PRICE BID WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			DOLLARS	CENTS	DOLLARS	CENTS
T-905-1	20,875 SY	<u>Topsoil</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Square Yard</u>				

BASE BID SUMMARY

Total Base Bid (written in figures): \$ _____

Total Base Bid (written in words): _____

Taxiway Construction Project
Additive Alternate 1 Unit Price Form

ITEM NO.	ESTIMATED QUANTITY	ITEM DESCRIPTION AND UNIT PRICE BID WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			DOLLARS	CENTS	DOLLARS	CENTS
G-002-1	1 LS	<u>As-Built Plans</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> and _____ Cents. <u>Per Lump Sum</u>				
M-001-2	1 LS	<u>Mobilization – Alternate #1</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> and _____ Cents. <u>Per Lump Sum</u>				
M-001-5	1 LS	<u>Engineer's Field Office – Alternate #1</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> and _____ Cents. <u>Per Lump Sum</u>				
M-001-8	1 LS	<u>Safety and Phasing Items – Alternate #1</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> and _____ Cents. <u>Per Lump Sum</u>				
M-003-1	1,000 LF	<u>Sawed Control Joints</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> and _____ Cents. <u>Per Linear Foot</u>				

Taxiway Construction Project
Additive Alternate 1 Unit Price Form

ITEM NO.	ESTIMATED QUANTITY	ITEM DESCRIPTION AND UNIT PRICE BID WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			DOLLARS	CENTS	DOLLARS	CENTS
M-004-1	540 SY	<u>Pavement Milling</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Square Yard</u>				
M-006-1	3 EA	<u>Clean Existing Structure</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Each</u>				
M-006-2	480 LF	<u>Clean Existing Conduit</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Linear Foot</u>				
P-152-1	16,100 CY	<u>Unclassified Excavation</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Cubic Yard</u>				
P-152-2	1 EA	<u>Structure Removal</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Each</u>				

Taxiway Construction Project
Additive Alternate 1 Unit Price Form

ITEM NO.	ESTIMATED QUANTITY	ITEM DESCRIPTION AND UNIT PRICE BID WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			DOLLARS	CENTS	DOLLARS	CENTS
P-152-3	235 LF	<u>Drainage Pipe Removal</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Linear Foot</u>				
P-152-7	1,000 LF	<u>Direct Buried Cable Removal</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Linear Foot</u>				
P-152-11	4 EA	<u>Relocate Habitat Delineation Marker</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Each</u>				
P-152-12	900 CY	<u>Embankment in Place</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Cubic Yard</u>				
P-154-1	3,050 CY	<u>Subbase Course</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Cubic Yard</u>				

Taxiway Construction Project
Additive Alternate 1 Unit Price Form

ITEM NO.	ESTIMATED QUANTITY	ITEM DESCRIPTION AND UNIT PRICE BID WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			DOLLARS	CENTS	DOLLARS	CENTS
P-156-1	3,450 LF	<u>Silt Fence (Taxiway)</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Linear Foot</u>				
P-156-2	950 LF	<u>Coir Logs Sediment Barrier</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Linear Foot</u>				
P-156-4	1 EA	<u>Construction Exit</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Each</u>				
P-156-6	9 EA	<u>Inlet Protection</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Each</u>				
P-156-7	1 LS	<u>Erosion and Sediment Control and Stormwater Management Plan</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Lump Sum</u>				

Taxiway Construction Project
Additive Alternate 1 Unit Price Form

ITEM NO.	ESTIMATED QUANTITY	ITEM DESCRIPTION AND UNIT PRICE BID WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			DOLLARS	CENTS	DOLLARS	CENTS
P-209-1	2,270 CY	<u>Crushed Aggregate Base Course</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Cubic Yard</u>				
P-401-1	2,620 TON	<u>Plant Mix Bituminous Pavements</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Ton</u>				
P-602-1	5,400 GAL	<u>Bituminous Prime Coat</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Gallon</u>				
P-603-1	1,705 GAL	<u>Bituminous Tack Coat</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Gallon</u>				
P-620-1	3,885 SF	<u>Permanent Paint Markings</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Square Foot</u>				

Taxiway Construction Project
Additive Alternate 1 Unit Price Form

ITEM NO.	ESTIMATED QUANTITY	ITEM DESCRIPTION AND UNIT PRICE BID WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			DOLLARS	CENTS	DOLLARS	CENTS
P-620-2	3,885 SF	<u>Temporary Paint Markings</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Square Foot</u>				
D-701-1	655 LF	<u>12 Inch Reinforced Concrete Pipe</u> <u>(Class V)</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Linear Foot</u>				
D-701-2	55 LF	<u>12 Inch Perforated HDPE Pipe</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Linear Foot</u>				
D-701-1	170 LF	<u>36 Inch Reinforced Concrete Pipe</u> <u>(Class V)</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Linear Foot</u>				
D-701-3	435 LF	<u>36 Inch Perforated HDPE Pipe</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Linear Foot</u>				

Taxiway Construction Project
Additive Alternate 1 Unit Price Form

ITEM NO.	ESTIMATED QUANTITY	ITEM DESCRIPTION AND UNIT PRICE BID WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			DOLLARS	CENTS	DOLLARS	CENTS
D-751-1	4 EA	<u>6-ft Diameter Manhole</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ Cents. <u>Per Each</u>				
D-751-2	5 EA	<u>4-ft Diameter Catch Basin</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ Cents. <u>Per Each</u>				
D-751-3	3 EA	<u>6-ft Diameter Catch Basin</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ Cents. <u>Per Each</u>				
D-751-5	5 EA	<u>Adjust Existing Structure to Grade</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ Cents. <u>Per Each</u>				
L-108-1	10,600 LF	<u>No. 8 AWG L-824C Cable, installed in duct bank or conduit</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ Cents. <u>Per Linear Foot</u>				

Taxiway Construction Project
Additive Alternate 1 Unit Price Form

ITEM NO.	ESTIMATED QUANTITY	ITEM DESCRIPTION AND UNIT PRICE BID WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			DOLLARS	CENTS	DOLLARS	CENTS
L-108-2	8,200 LF	<u>No. 6 AWG L-824C Cable, installed in duct bank or conduit</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> and _____ Cents. <u>Per Linear Foot</u>				
L-108-3	6,000 LF	<u>Bare Counterpoise Wire, installed in trench, duct bank or conduit, including ground</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> and _____ Cents. <u>Per Linear Foot</u>				
L-109-1	1 LS	<u>Miscellaneous Work in Vault</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> and _____ Cents. <u>Per Lump Sum</u>				
L-110-1	55 LF	<u>Concrete-Encased Electrical Duct Bank, 1Way-2" Schedule 40 PVC</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> and _____ Cents. <u>Per Linear Foot</u>				
L-110-2	280 LF	<u>Concrete-Encased Electrical Duct Bank, 2Way-4" Schedule 40 PVC</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> and _____ Cents. <u>Per Linear Foot</u>				

Taxiway Construction Project
Additive Alternate 1 Unit Price Form

ITEM NO.	ESTIMATED QUANTITY	ITEM DESCRIPTION AND UNIT PRICE BID WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			DOLLARS	CENTS	DOLLARS	CENTS
L-110-3	5,650 LF	<u>Electrical Conduit, 2" Schedule 40 PVC, Direct Buried</u> <div style="text-align: right;">_____ Dollars</div> <div>(words)</div> <div>and _____ Cents.</div> <u>Per Linear Foot</u>				
L-110A-1	180 LF	<u>Installation of Conduit via HDD</u> <div style="text-align: right;">_____ Dollars</div> <div>(words)</div> <div>and _____ Cents.</div> <u>Per Linear Foot</u>				
L-115-1	8 EA	<u>Electrical Handhole, 4'x4'x4'</u> <div style="text-align: right;">_____ Dollars</div> <div>(words)</div> <div>and _____ Cents.</div> <u>Per Each</u>				
L-125-1	10 EA	<u>L-861T Taxiway Edge Light, base mounted, infield</u> <div style="text-align: right;">_____ Dollars</div> <div>(words)</div> <div>and _____ Cents.</div> <u>Per Each</u>				
L-125-3	44 EA	<u>L-861T Taxiway Edge Light, stake mounted</u> <div style="text-align: right;">_____ Dollars</div> <div>(words)</div> <div>and _____ Cents.</div> <u>Per Each</u>				

Taxiway Construction Project
Additive Alternate 1 Unit Price Form

ITEM NO.	ESTIMATED QUANTITY	ITEM DESCRIPTION AND UNIT PRICE BID WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			DOLLARS	CENTS	DOLLARS	CENTS
L-125-5	4 EA	<u>L-858 1-Module, Size 1 Guidance Sign</u> <div style="text-align: right;">_____ Dollars</div> <div>(words)</div> <div>and _____ Cents.</div> <u>Per Each</u>				
L-125-7	3 EA	<u>L-858 3-Module, Size 1 Guidance Sign</u> <div style="text-align: right;">_____ Dollars</div> <div>(words)</div> <div>and _____ Cents.</div> <u>Per Each</u>				
L-125-8	2 EA	<u>L-858 4-Module, Size 1 Guidance Sign</u> <div style="text-align: right;">_____ Dollars</div> <div>(words)</div> <div>and _____ Cents.</div> <u>Per Each</u>				
L-125-10	2 EA	<u>L-858 2-Module, Size 2 Guidance Sign</u> <div style="text-align: right;">_____ Dollars</div> <div>(words)</div> <div>and _____ Cents.</div> <u>Per Each</u>				
L-125-11	3 EA	<u>L-858 3-Module, Size 2 Guidance Sign</u> <div style="text-align: right;">_____ Dollars</div> <div>(words)</div> <div>and _____ Cents.</div> <u>Per Each</u>				

Taxiway Construction Project
Additive Alternate 1 Unit Price Form

ITEM NO.	ESTIMATED QUANTITY	ITEM DESCRIPTION AND UNIT PRICE BID WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			DOLLARS	CENTS	DOLLARS	CENTS
L-125-13	1 EA	<u>L-881 Precision Approach Path Indicator</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Each</u>				
T-901-1	33,350 SY	<u>Conservation Habitat Seed</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Square Yard</u>				
T-901-3	33,350 SY	<u>Wood Fiber Mulch</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Square Yard</u>				
T-905-1	33,350 SY	<u>Topsoil</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Square Yard</u>				

ADDITIVE ALTERNATE 1 SUMMARY

Total Base Bid (written in figures): \$ _____

Total Base Bid (written in words): _____

Taxiway Construction Project
Additive Alternate 2 Unit Price Form

ITEM NO.	ESTIMATED QUANTITY	ITEM DESCRIPTION AND UNIT PRICE BID WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			DOLLARS	CENTS	DOLLARS	CENTS
G-002-1	1 LS	<u>As-Built Plans</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Lump Sum</u>				
G-002-2	1 LS	<u>Aerial Photographs</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Lump Sum</u>				
M-001-3	1 LS	<u>Mobilization – Alternate #2</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Lump Sum</u>				
M-001-6	1 LS	<u>Engineer's Field Office – Alternate #2</u> <div style="text-align: right;">_____ Dollars</div> <div style="text-align: center;">(words)</div> <u>and</u> _____ <u>Cents.</u> <u>Per Lump Sum</u>				
M-001-9	1 LS	<u>Safety and Phasing Items – Alternate #2</u> <div style="text-align: right;">_____ Dollars</div> <div style="text-align: center;">(words)</div> <u>and</u> _____ <u>Cents.</u> <u>Per Lump Sum</u>				

Taxiway Construction Project
Additive Alternate 2 Unit Price Form

ITEM NO.	ESTIMATED QUANTITY	ITEM DESCRIPTION AND UNIT PRICE BID WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			DOLLARS	CENTS	DOLLARS	CENTS
M-003-1	130 LF	<u>Sawed Control Joints</u> _____ Dollars (words) and _____ Cents. <u>Per Linear Foot</u>				
P-152-1	7,850 CY	<u>Unclassified Excavation</u> _____ Dollars (words) and _____ Cents. <u>Per Cubic Yard</u>				
P-152-2	2 EA	<u>Structure Removal</u> _____ Dollars (words) and _____ Cents. <u>Per Each</u>				
P-152-3	275 LF	<u>Drainage Pipe Removal</u> _____ Dollars (words) and _____ Cents. <u>Per Linear Foot</u>				
P-152-5	10 EA	<u>Elevated Light Removal</u> _____ Dollars (words) and _____ Cents. <u>Per Each</u>				

Taxiway Construction Project
Additive Alternate 2 Unit Price Form

ITEM NO.	ESTIMATED QUANTITY	ITEM DESCRIPTION AND UNIT PRICE BID WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			DOLLARS	CENTS	DOLLARS	CENTS
P-152-6	1 EA	<u>Guidance Sign Removal</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> and _____ Cents. <u>Per Each</u>				
P-152-8	160 LF	<u>Concrete Encased Ductbank Removal</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> and _____ Cents. <u>Per Linear Foot</u>				
P-152-9	560 LF	<u>Conduit Removal</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> and _____ Cents. <u>Per Linear Foot</u>				
P-154-1	900 CY	<u>Subbase Course</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> and _____ Cents. <u>Per Cubic Yard</u>				
P-156-1	1,000 LF	<u>Silt Fence</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> and _____ Cents. <u>Per Lump Sum</u>				

Taxiway Construction Project
Additive Alternate 2 Unit Price Form

ITEM NO.	ESTIMATED QUANTITY	ITEM DESCRIPTION AND UNIT PRICE BID WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			DOLLARS	CENTS	DOLLARS	CENTS
P-156-2	105 LF	<u>Coir Log Sediment Barrier</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Linear Foot</u>				
P-156-6	5 EA	<u>Inlet Protection</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Each</u>				
P-156-7	1 LS	<u>Erosion and Sediment Control and Stormwater Management Plan</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Lump Sum</u>				
P-209-1	1,025 CY	<u>Crushed Aggregate Base Course</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Cubic Yard</u>				
P-401-1	1,125 TON	<u>Plant Mix Bituminous Pavements</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Ton</u>				

Taxiway Construction Project
Additive Alternate 2 Unit Price Form

ITEM NO.	ESTIMATED QUANTITY	ITEM DESCRIPTION AND UNIT PRICE BID WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			DOLLARS	CENTS	DOLLARS	CENTS
P-602-1	1,775 GAL	<u>Bituminous Prime Coat</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Gallon</u>				
P-603-1	550 GAL	<u>Bituminous Tack Coat</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Gallon</u>				
P-620-1	1,300 SF	<u>Permanent Paint Markings</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Square Foot</u>				
P-620-3	625 SF	<u>Paint Marking Removal</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Square Foot</u>				
D-701-1	145 LF	<u>12 Inch Reinforced Concrete Pipe</u> <u>(ClassV)</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> _____ <u>Cents.</u> <u>Per Linear Foot</u>				

Taxiway Construction Project
Additive Alternate 2 Unit Price Form

ITEM NO.	ESTIMATED QUANTITY	ITEM DESCRIPTION AND UNIT PRICE BID WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			DOLLARS	CENTS	DOLLARS	CENTS
D-701-4	435 LF	<u>36 Inch Perforated HDPE Pipe</u> <div style="text-align: right;">_____ Dollars</div> <div>(words)</div> <div>and _____ Cents.</div> <u>Per Linear Foot</u>				
D-751-2	1 EA	<u>4-ft Diameter Catch Basin</u> <div style="text-align: right;">_____ Dollars</div> <div>(words)</div> <div>and _____ Cents.</div> <u>Per Each</u>				
D-751-3	1 EA	<u>6-ft Diameter Catch Basin</u> <div style="text-align: right;">_____ Dollars</div> <div>(words)</div> <div>and _____ Cents.</div> <u>Per Each</u>				
D-751-6	1 EA	<u>8-ft Diameter Manhole</u> <div style="text-align: right;">_____ Dollars</div> <div>(words)</div> <div>and _____ Cents.</div> <u>Per Each</u>				
L-108-1	4,650 LF	<u>No. 8 AWG L-824C Cable, installed in duct bank or conduit</u> <div style="text-align: right;">_____ Dollars</div> <div>(words)</div> <div>and _____ Cents.</div> <u>Per Linear Foot</u>				

Taxiway Construction Project
Additive Alternate 2 Unit Price Form

ITEM NO.	ESTIMATED QUANTITY	ITEM DESCRIPTION AND UNIT PRICE BID WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			DOLLARS	CENTS	DOLLARS	CENTS
L-108-3	1,525 LF	<u>Bare Counterpoise Wire, installed in trench, duct bank or conduit, including ground</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> <div style="text-align: right;">_____ Cents.</div> <u>Per Linear Foot</u>				
L-110-2	70 LF	<u>Concrete-Encased Electrical Duct Bank, 2Way-4" Schedule 40 PVC</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> <div style="text-align: right;">_____ Cents.</div> <u>Per Linear Foot</u>				
L-110-3	1,450 LF	<u>Electrical Conduit, 2" Schedule 40 PVC, Direct Buried</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> <div style="text-align: right;">_____ Cents.</div> <u>Per Linear Foot</u>				
L-115-1	2 EA	<u>Electrical Handhole, 4'x4'x4'</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> <div style="text-align: right;">_____ Cents.</div> <u>Per Each</u>				
L-125-1	4 EA	<u>L-861T Taxiway Edge Light, base mounted, infield</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and</u> <div style="text-align: right;">_____ Cents.</div> <u>Per Each</u>				

Taxiway Construction Project
Additive Alternate 2 Unit Price Form

ITEM NO.	ESTIMATED QUANTITY	ITEM DESCRIPTION AND UNIT PRICE BID WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			DOLLARS	CENTS	DOLLARS	CENTS
L-125-3	21 EA	<u>L-861T Taxiway Edge Light, stake mounted</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and _____ Cents.</u> <u>Per Each</u>				
L-125-9	1 EA	<u>L-858 1-Module, Size 2 Guidance Sign</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and _____ Cents.</u> <u>Per Each</u>				
L-125-11	1 EA	<u>L-858 3-Module, Size 2 Guidance Sign</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and _____ Cents.</u> <u>Per Each</u>				
L-125-12	4 EA	<u>Remove and Replace Existing Sign Panel</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and _____ Cents.</u> <u>Per Each</u>				
T-901-1	15,400 SY	<u>Conservation Habitat Seed</u> <div style="text-align: right;">_____ Dollars</div> <u>(words)</u> <u>and _____ Cents.</u> <u>Per Square Yard</u>				

Taxiway Construction Project
Additive Alternate 2 Unit Price Form

ITEM NO.	ESTIMATED QUANTITY	ITEM DESCRIPTION AND UNIT PRICE BID WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			DOLLARS	CENTS	DOLLARS	CENTS
T-901-3	15,400 SY	<u>Wood Fiber Mulch</u> <div style="text-align: right;">Dollars</div> <u>(words)</u> <div style="text-align: right;">Cents.</div> <u>and</u> <u>Per Square Yard</u>				
T-905-1	15,400 SY	<u>Topsoil</u> <div style="text-align: right;">Dollars</div> <u>(words)</u> <div style="text-align: right;">Cents.</div> <u>and</u> <u>Per Square Yard</u>				

ADDITIVE ALTERNATE 2 SUMMARY

Total Add. Alt. 2 (written in figures): \$ _____

Total Add. Alt. 2 (written in words): _____

BID SUMMARY

Total Bid* (written in figures): \$ _____

Total Bid* (written in words): _____

* Total Bid shall consist of Base Bid **plus** Additive Alternate 1 **plus** Additive Alternate 2.

The contract will be awarded to the RESPONSIBLE BIDDER submitting the lowest qualified bid. Reference Section 6, *Method of Award*, of the Information for Bidders for specific details on how the lowest qualified bid will be determined.

In the event there is a discrepancy between the prices written in words and those written in figures, the prices written in words shall govern. No bid will be considered which does not contain a price for every item tabulated in the bid form. Unit prices shall govern incorrectly extended total amounts.

The above unit prices shall include all labor, materials, equipment, incidentals, expenses, overhead, profit, insurance, etc., to cover the finished work of the several kinds called for.

Bidder understands that the Owner reserves the right to reject any or all bids and to waive any formality, informality, information and/or errors in the bidding.

The bidder agrees that this bid shall be good and may not be withdrawn for one hundred eighty (180) calendar days.

The bidder agrees that the Owner may reduce the quantities under any bid item or may delete work items altogether if necessary to bring the contract awarded within funds available to finance the project. Such reduction or deletion of work shall not constitute a basis for withdrawal of this proposal or for adjustment of the unit or lump sum prices bid.

Upon receipt of written notice of acceptance of this bid, bidder will execute the formal contract attached within ten (10) calendar days and deliver the Surety Bonds as required by the Contract Articles. The bid security attached in the sum of

_____ (\$ _____)

is to become the property of the Owner in the event the contract and bonds are not executed within the time above set forth, as liquidated damages for the delay and additional expenses to the Owner caused thereby.

Respectfully submitted:

Name of Bidder:

By:

(Signature)

Name and Title:

(Print or Type)

Company Name/Business Address/Telephone/Email:

(SEAL if bid is by a corporation)

**CERTIFICATE AS TO CORPORATE PRINCIPAL
PROPOSAL**

I, _____, certify that I am the
_____ of the corporation named as Bidder
in the above Proposal; that _____, who signed the said Proposal
on behalf of the Bidder was then _____, of said corporation; that
I know his/her signature and his/her signature thereto is genuine; and that said Proposal was
duly signed, sealed and attested to for and in behalf of said corporation by authority of its
governing body and is within the scope of its corporate powers.

_____ (Corporate Seal)

The DBE goal for this project is 4.1 percent.

All Bidders must submit an Assurance stating the percentages of minority business and women owned businesses they intend to employ on this project.

Within 7 working days of the opening of Bids and before the award of a contract, the apparent successful competitor shall submit the following:

1. Name(s) of DBE subcontractor(s).
2. Description of work each is to perform.
3. Dollar value of each proposed minority business subcontract(s).

If Bidders wish, they may submit the above information, in a separate, sealed envelope marked "D.B.E. Participation Information" with their Bid.

REQUIRED ASSURANCE TO BE INCLUDED IN ALL PROPOSALS

This firm assures that it will utilize no less than _____ % DBE participation.

CERTIFICATION OF BIDDER for the above:

BIDDER'S NAME _____

ADDRESS _____

IRS NUMBER _____

If the apparent successful competitor does not meet the goal, it shall submit a statement showing that a good faith effort was made by the competitor to meet the goal.

NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

AFFIRMATIVE ACTION CERTIFICATION

The Bidder (has / has not) participated in a previous contract subject to the equal opportunity clause prescribed by Executive Order 10925, or Executive Order 11246, or Executive Order 11114.

The Bidder (has / has not) submitted all compliance reports in connection with any such contract due under the applicable filing requirements; and that representations indicating submission of required compliance reports signed by proposed subcontractors will be obtained prior to award of subcontracts.

If the Bidder has participated in a previous contract subject to the equal opportunity clause and has not submitted compliance reports due under applicable filing requirements, the Bidder (Proposer) shall submit a compliance report on Standard Form 100, "Employee Information Report EE0-1" prior to the award of contract.

The Bidder (has / has not) been considered for sanction due to violation of Executive Order 11246, as amended.

Dated _____, 2013

Legal Name of Person, Firm or Corporation

By: _____

Title

CERTIFICATION OF NONSEGREGATED FACILITIES

The federally-assisted construction contractor certifies that she or he does not maintain or provide, for his employees, any segregated facilities at any of his establishments and that she or he does not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. The federally-assisted construction contractor certifies that she or he will not maintain or provide, for his employees, segregated facilities at any of his establishments and that she or he will not permit his employees to perform their services at any location under his control where segregated facilities are maintained. The federally-assisted construction contractor agrees that a breach of this certification is a violation of the Equal Opportunity Clause in this contract.

As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms, and washrooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directives or are, in fact, segregated on the basis of race, color, religion, or national origin because of habit, local custom, or any other reason. The federally-assisted construction contractor agrees that (except where she or he has obtained identical certifications from proposed subcontractors for specific time periods) she or he will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding \$10,000 which are not exempt from the provisions of the Equal Opportunity Clause and that she or he will retain such certifications in his files.

Dated _____, 20____

Legal Name of Person, Firm or Corporation

By _____

BUY AMERICAN CERTIFICATE

By submitting a bid/proposal under this solicitation, except for those items listed by the offeror below or on a separate and clearly identified attachment to this bid/proposal, the offeror certifies that steel and each manufactured product, are produced in the United States, as defined in the clause Buy American - Steel and Manufactured Products for Construction Contracts and that components of unknown origin are considered to have been produced or manufactured outside the United States.

Offerors may obtain from the owner a listing of articles, materials and supplies excepted from this provision.

Product	Country of Origin

Dated _____, 20____

Legal Name of Person, Firm or Corporation

By _____

Request for Taxpayer Identification Number and Certification

Give Form to the
requester. Do not
send to the IRS.

Print or type your specific instructions on page 3.	Name (as shown on your income tax return)	
	Business name/disregarded entity name, if different from above	
	Check appropriate box for federal tax classification: <input type="checkbox"/> Individual/sole proprietor <input type="checkbox"/> C Corporation <input type="checkbox"/> S Corporation <input type="checkbox"/> Partnership <input type="checkbox"/> Trust/estate <input type="checkbox"/> Limited liability company. Enter the tax classification (C=C corporation, S=S corporation, P=partnership) ▶ _____ <input type="checkbox"/> Other (see instructions) ▶ _____	
	Address (number, street, and apt. or suite no.)	Requester's name and address (optional)
	City, state, and ZIP code	List account number(s) here (optional)

Part I Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. The TIN provided must match the name given on the "Name" line to avoid backup withholding. For individuals, this is your social security number (SSN). However, for a resident alien, sole proprietor, or disregarded entity, see the Part I instructions on page 3. For other entities, it is your employer identification number (EIN). If you do not have a number, see *How to get a TIN* on page 3.

Note. If the account is in more than one name, see the chart on page 4 for guidelines on whose number to enter.

Social security number									
Employer identification number									

Part II Certification

Under penalties of perjury, I certify that:

1. The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me), and
2. I am not subject to backup withholding because: (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding, and
3. I am a U.S. citizen or other U.S. person (defined below).

Certification instructions. You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and generally, payments other than interest and dividends, you are not required to sign the certification, but you must provide your correct TIN. See the instructions on page 4.

Sign Here	Signature of U.S. person ▶ _____	Date ▶ _____
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General Instructions

Section references are to the Internal Revenue Code unless otherwise noted.

Purpose of Form

A person who is required to file an information return with the IRS must obtain your correct taxpayer identification number (TIN) to report, for example, income paid to you, real estate transactions, mortgage interest you paid, acquisition or abandonment of secured property, cancellation of debt, or contributions you made to an IRA.

Use Form W-9 only if you are a U.S. person (including a resident alien), to provide your correct TIN to the person requesting it (the requester) and, when applicable, to:

1. Certify that the TIN you are giving is correct (or you are waiting for a number to be issued),
2. Certify that you are not subject to backup withholding, or
3. Claim exemption from backup withholding if you are a U.S. exempt payee. If applicable, you are also certifying that as a U.S. person, your allocable share of any partnership income from a U.S. trade or business is not subject to the withholding tax on foreign partners' share of effectively connected income.

Note. If a requester gives you a form other than Form W-9 to request your TIN, you must use the requester's form if it is substantially similar to this Form W-9.

Definition of a U.S. person. For federal tax purposes, you are considered a U.S. person if you are:

- An individual who is a U.S. citizen or U.S. resident alien,
- A partnership, corporation, company, or association created or organized in the United States or under the laws of the United States,
- An estate (other than a foreign estate), or
- A domestic trust (as defined in Regulations section 301.7701-7).

Special rules for partnerships. Partnerships that conduct a trade or business in the United States are generally required to pay a withholding tax on any foreign partners' share of income from such business. Further, in certain cases where a Form W-9 has not been received, a partnership is required to presume that a partner is a foreign person, and pay the withholding tax. Therefore, if you are a U.S. person that is a partner in a partnership conducting a trade or business in the United States, provide Form W-9 to the partnership to establish your U.S. status and avoid withholding on your share of partnership income.

**THE FOLLOWING INDEMNIFICATION AGREEMENT SHALL BE, AND IS
HEREBY A
PROVISION OF ANY CONTRACT**

The successful contractor agrees to indemnify, investigate, protect, defend and save harmless the City of Concord New Hampshire, its officials, officers, agents and employees from any and all claims and losses accruing or resulting to any and all contractors, subcontractors, suppliers, laborers and any other person, firm, or corporation furnishing or supplying work, services, materials or supplies in connection with the performance of this contract, and from any and all claims and losses accruing or resulting to any person, firm or corporation which may be injured or damaged by the contractor in the performance of this contract. In any case, the foregoing provisions concerning indemnification shall not be construed to indemnify the City of Concord New Hampshire for damage arising out of bodily injury to persons or damage to property caused by or resulting from the sole negligence of the City of Concord New Hampshire or its employees. This indemnification shall survive the expiration or early termination of this contract.

COMPANY _____

TAXPAYER IDENTIFICATION NUMBER _____

AUTHORIZED SIGNATURE _____

DATE _____

ADDRESS _____

TELEPHONE _____

E-MAIL ADDRESS _____

Failure to submit this form with your Bid may result in your Bid being rejected as unresponsive.

STATEMENT OF BIDDER'S QUALIFICATIONS

All questions must be answered and the data given must be clear and comprehensive. This statement must be notarized. Where necessary, questions shall be answered on separate attached sheets. The Bidder may submit any additional information he/she desires.

1.0 Name of Bidder:

1.a Bidder is: Corporation ()
 Partnership ()
 Individual ()

2.0 Permanent main office address:

2.a Treasury Number (Employer's Identification No.):

3.0 When organized: _____

4.0 If a corporation, where incorporated?

5.0 How many years have you been engaged in the contracting business under your present firm or trade name?

5.a Names and home addresses of the principal officers. (List all partners if a partnership.)

6.0 Contracts on hand: (Schedule these, showing gross amount of each contract and the appropriate anticipated dates of completion. Name and address of client and name of person supervising for client.)

7.0 General character of work performed by your company.

8.0 Have you ever failed to complete any work awarded to you?
If so, where and why? () Yes () No

9.0 Have you ever defaulted on a contract? () Yes () No If so, where and why?

10.0 List similar contracts recently completed by you, stating description of project, approximate cost for each, and the month and year completed. (Give name and address of client and name of person supervising for client.)

- 11.0 List your major equipment available for this contract.
- 12.0 Background and experience of the principal members of your organization, including the officers.
- 13.0 Credit available: \$ _____
- 14.0 Give bank reference. (Bank name and address; name of bank officer who may be contacted.)
- 15.0 Furnish a financial statement as required by Section 20 of these specifications.
- 16.0 The Undersigned hereby authorizes and requests any person, firm, or corporation to furnish any information requested by the Owner in verification of the recitals comprising this Statement of the Bidder's Qualifications.

(Bidder Company Name)

(Name of Bidder)

(Signature of Bidder)

Date: _____ Title _____

State of (_____)

County of (_____)

Notarized _____

NO BID QUESTIONNAIRE

Reference: B27-13

If you choose not to bid, please complete the questionnaire below and return it with your response by the bid opening date. Your assistance in helping us to analyze no bid rationale is very much appreciated. Thank you.

* * * * No Bid Questionnaire * * * *

A no bid is submitted in reply to the City of Concord Invitation for Bids (B27-13, Taxiway Construction Project, Concord Municipal Airport, dated _____, for the following reasons:

- _____ Item not supplied by our company.
- _____ Bid specification (give reason(s), e.g., too restricted, not clear, etc.):

- _____ Profit margin on municipal bids too low.
- _____ Past experience with City of Concord (give specifics, e.g., payment delay, bid process, administrative problems, etc) _____
- _____ Insufficient time allowed to prepare and respond to bid request.
- _____ Bid requirement too large _____ or too small _____ for our company.
- _____ Priority of other business opportunities limit time/other resources available to deliver or perform according to bid specifications.
- _____ Other reason(s), please specify: _____

.....

Company Name and Address: _____

Phone: () _____

(Signature)

(Typed/Printed Name & Title)

BID SUBMISSION CHECKLIST

In order to be considered responsive, each prospective contractor must submit the following documents, in one (1) original as part of his/her bid:

1. Complete Proposal
2. Certificates
 - a. Certificate as to Corporate Principal
 - b. DBE Goal Certification
 - c. Affirmative Action Certification
 - d. Certification of Non-Segregated Facilities
 - e. Buy American Certificate
3. Form W-9
4. Indemnification Agreement
5. Bidder's Qualifications
6. Bid Bond

The successful contractor must submit, prior to contract signing, the following documentation:

1. 100% Payment Bond
2. 100% Performance Bond
3. Insurance Certificate (Owner shall be named certificate holder and the Owner, State Department of Transportation and Engineer shall be named as additional insured on all policies.)

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BID BOND

KNOW ALL MEN BY THESE PRESENTS, THAT WE, THE UNDERSIGNED,

(Name of Principal)

as PRINCIPAL, and

(Name of Surety)

as SURETY, are held and are firmly bound unto The City of Concord New Hampshire hereinafter called the Owner, in the penal sum of:

(\$ _____)

lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Principal has submitted the accompanying Bid, dated _____

For bid entitled:

**B27-13, Taxiway Construction Project Concord Municipal Airport
SBG-04-08-2013**

NOW, THEREFORE, if the Principal shall not withdraw said bid **one hundred eighty (180) calendar days** after the opening thereof, and shall within ten (10) calendar days after the prescribed forms are presented to him for signature, enter into a written Contract with the Owner in accordance with the bid as accepted, and give bonds with good and sufficient surety or sureties, as may be required, for the faithful performance and proper fulfillment of such Contract; or in the event of the withdrawal of said bid within the period specified, or the failure to enter into such Contract and give such bonds within the time specified, if the Principal shall pay the Owner the difference between the amount specified in said bid and the amount for which the Owner may procure the required work or supplies or both, if the latter amount be in excess of the former, then the above obligation shall be void and of no effect, otherwise to remain in full force and virtue. IN WITNESS WHEREOF, the above named Principal and Surety have executed this instrument under their several seals this _____, _____ day of _____, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

In the presence of:

_____, SEAL
Individual Principal

Business Address

_____, SEAL
Individual Principal

Business Address

Attest:

Corporate Principal
Affix Corporate Seal

Business Address

Attest:

By:

Corporate Surety
Affix Corporate Seal

Business Address

Countersigned:

By: _____
Attorney-in-Fact

By: _____

(Power of Attorney for person(s) signing for Surety Company must be attached to this bond.)

CERTIFICATE AS TO CORPORATE PRINCIPAL

I, _____, certify that I am
the _____ of the corporation named as Principal in the within bond;
that _____, who signed the said bond on behalf of the Principal was then of said
corporation; that I know his signature, and his signature thereto is genuine, and that said bond was duly signed,
sealed, and attested to for and in behalf of said corporation by authority of its governing body.

(Corporate Seal)

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CONTRACT

THIS AGREEMENT, made and executed this _____ day of _____ in the year Two Thousand Thirteen by and between the City of Concord, in the State of New Hampshire, being herein termed the OWNER, party of the first part, and _____ of _____, hereinafter termed the CONTRACTOR, party of the second part;

WITNESSETH: That for and in consideration of the payments and agreements hereinafter mentioned, (Contract Articles), and performed by the OWNER, the CONTRACTOR hereby agrees with the OWNER to commence and complete the following work:

ARTICLE 1. Statement of Work.

The Contractor shall furnish all labor, material, equipment and services, and perform and complete all work, including all extra work directed, all as required to complete B27-13, Taxiway Construction Project - Base Bid located at 71 Airport Road, Concord, NH (SBG-04-08-2013). The work shall be performed in strict accordance with all requirements of Specifications including addenda to said Specifications which addenda are numbered and dated as follows:

Addendum No.	Dated
_____	_____
_____	_____
_____	_____
_____	_____

and including the Drawings referred to in said Specifications, all as prepared by Jacobs Engineering Group, Inc., 2 Executive Park Drive, Bedford, New Hampshire 03110, which said Specifications, Addenda and Drawings are incorporated herein, referenced and made a part hereof.

ARTICLE 2. The Contract Price.

The Owner shall pay the Contractor for this satisfactory performance of the Contract, in current funds, subject to additions and deductions as provided in the Specifications, the not-to-exceed sum of

ARTICLE 3. Contract Documents.

The executed Contract Documents shall consist of the following component parts:

- a) This instrument
- b) Addenda as listed herein
- c) Advertisement for Bids
- d) Information for Bidders
- e) Signed Copy of Bid
- f) Certifications by Bidder
- g) Requirements of the FAA
- h) Contract Articles
- i) Supplemental Contract Articles
- j) Technical Specifications
- k) Drawings (as listed in the Schedule of Drawings)

This instrument, together with the other documents enumerated in this Article 3, which said other documents are as fully a part of the Contract as if hereto attached or herein repeated, from the Contract. In the event that any provision

in any component part of this Contract conflicts with any provision of any other component part, the provision of the component part first enumerated in this Article 3. shall govern, except as otherwise specifically stated. The various provisions in Addenda shall be construed in the order of preference of the component part of the Contract which each modified.

ARTICLE 4. Time for Completion.

The Contractor hereby agrees to commence work under this Contract on a date to be specified in a written "Notice to Proceed" of the Owner, and to fully complete the project within **60 calendar days (for Base Bid Work Only)** of said specified date as specifically detailed in the Owner's Notice to Proceed. The Contractor further agrees to pay **one thousand dollars (\$1,000.00) plus inspection/engineering costs** per calendar day to the Owner, as liquidated damages for each and every calendar day the work remains incomplete beyond the **60 calendar days** from the Notice to Proceed Date, as specifically detailed in the Contract Documents, as hereinafter provided in the General Provisions.

ARTICLE 5. Certificates of Insurance.

The Contractor shall furnish Certificates of Insurance as described in the Supplemental Contract Articles, paragraph V. These Insurance Certificates as well as Performance and Payment Bonds must be furnished at the time of the execution of this document.

IN WITNESS THEREOF, the parties to these presents have executed this Contract in six (6) counterparts each of which shall be deemed an original, as of the year and day first above mentioned.

ATTEST:

The City of Concord New Hampshire
(Owner)

(Witness)

By: _____

(Title)

ATTEST:

(Contractor)

(Witness)

By: _____

(Title)

(Address and Zip Code)

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LABOR AND MATERIALS BOND

KNOW ALL MEN BY THESE PRESENTS:

That, _____, a corporation organized under the laws of the State of _____, having a usual place of business at _____, as Principal, and _____ a corporation organized under the laws of the _____ of _____, which company is authorized to transact business of suretyship in the State of New Hampshire and has a usual place of business in _____, as Surety, are holden and stand firmly bound and obligated unto the _____ as Obligees, in the sum of _____ dollars

_____ lawful money of the United States of America, for payment of which, well and truly to be made, we hereby, jointly and severally, bind ourselves and each of us our heirs, executors, administrators, successors, and assigns by these presents.

B27-13, Taxiway Construction Project Concord Municipal Airport SBG-04-08-2013

WHEREAS, the said Principal has pursuant to a written proposal, accepted by the City of Concord entered into Contract with said Obligees, dated _____, 2013, a copy of which Contract is attached hereto and by reference made a part hereof:

NOW, THEREFORE, THE CONDITION of this obligation is such that if said principal shall well and truly pay for all labor performed or furnished and materials used or employed therein, including lumber so employed which is not incorporated therein and is not wholly or necessarily consumed or made so worthless as to use its identity but only to the extent of its purchase price less its fair salvage value and including also any material specifically fabricated at the order of the contractor or subcontractor for use as a component part of said public work so as to be unsuitable for use elsewhere, even though such material has not been delivered and incorporated into the public work, but only to the extent of its purchase price less its fair salvage value and only to the extent that such specially fabricated material is in conformity with the contract, plans, and specifications or any changes therein duly made; for payment of transportation charges, for materials used or employed therein which are consigned to the contractor or a subcontractor who has direct contractual relationship with the contractor; for payment by such contractor and subcontractors of any sums due for the rental or hire of vehicles, steam shovels, rollers propelled by steam or other power, concrete mixers, tools and other appliances and equipment employed in such construction; for payment of transportation charges directly related to such rental or hire; and for payment by such contractor and subcontractors of any sums due trustees or other persons authorized to collect such payments from the contractor or subcontractors based upon the labor performed or furnished as aforesaid for health and welfare plans, supplementary unemployment benefit plans and other fringe benefits which are payable in cash and provided for in collective bargaining agreements between organized labor and the contractor or subcontractors and provided that any such trustees or other persons authorized to collect such payments for health and welfare plans, supplementary unemployment benefit plans and

other fringe benefits shall, subject to certain statutory provisions contained in the general laws of the State in which the project is to be undertaken, as amended, be entitled to the benefit of the security only in an amount based upon labor performed or furnished as aforesaid for a maximum of the calendars described in the General Specifications, this obligation shall be void; otherwise, it shall remain in full force and effect.

And the said Surety, for value received, hereby stipulates and agrees that no extension of time, or change in, alteration of, or addition to the terms of the contractor or the specifications accompanying the same shall in any way affect its obligation on this bond, and it does hereby waive notice of any such extension of time, alteration of or addition to the terms of the Contractor or to the specifications.

IN WITNESS WHEREOF, we have hereunto set out hands and seals to this bond this _____
day of _____ 2013.

WITNESS:

Name of Principal (SEAL)

By: _____

WITNESS:

Name of Surety (SEAL)

(SEAL)

Power of Attorney for person signing for the Surety Company must be attached.

LABOR AND MATERIALS BOND
CERTIFICATE AS TO CORPORATE PRINCIPAL

I, _____, certify that I am the _____
of the corporation named as Principal in the within Bond; that _____,
who signed the said Bond on behalf of the Principal was then _____
of said corporation; that I know his signature and his signature is genuine; and that said Bond was duly signed, sealed, and
attested for and in behalf of said corporation by authority of its governing body.

_____, 2013

_____ Corporate Seal

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS:

That, _____, a corporation organized under the laws of the State of _____
_____, having a usual place of business at _____ as Principal, and
_____ a corporation organized under the laws of the _____
of _____ which company is authorized to transact business of suretyship in the State of New
Hampshire and has a usual place of business in _____,
as Surety, are holden and stand firmly bound and obligated unto the City of Concord, as Obligee, in the sum of _____
_____, dollars
_____, lawful money of the United States of America, for payment of which, well and truly to be
made, we hereby, jointly and severally, bind ourselves and each of us our heirs, executors, administrators, successors, and
assigns by these presents.

WHEREAS, the said Principal has pursuant to a written proposal, accepted by the City of Concord, entered into Contract
with said Obligee, dated _____ 2013, a copy of which Contract is attached hereto and by
reference made a part hereof:

**B27-13, Taxiway Construction Project Concord Municipal Airport
SBG-04-08-2013**

NOW, THEREFORE, THE CONDITION of the obligation is such that, if the said Principal shall well and truly keep and
perform all of the agreements, terms, and conditions of said contract on his part to be kept and performed or furnished, this
obligation shall be void; otherwise, it shall remain in full force and effect.

And the said Surety, for value received, hereby stipulates and agrees that no extension of time, or change in, alteration of, or
addition to the terms of the contract or the specifications accompanying the same in any way effect its obligations on this
bond, and it does hereby waive notice of any such extension of time, alteration of, or addition to the terms of the contract or to
the specifications.

IN WITNESS WHEREOF, we have hereunto set out hands and seals to this bond this _____
day of _____, 2013.

WITNESS:

Name of Principal (SEAL)

By: _____

WITNESS:

Name of Surety (SEAL)

Power of Attorney for person signing for the Surety Company must be attached.

PERFORMANCE BOND

CERTIFICATE AS TO CORPORATE PRINCIPAL

I, _____, certify that I am the _____
of the corporation named as Principal in the within Bond; that _____
who signed the said Bond on behalf of the Principal was then _____
of said corporation; that I know his signature and his signature is genuine; and that said Bond was duly signed, sealed, and
attested for and in behalf of said corporation by authority of its governing body.

_____, 2013

_____ Corporate Seal

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NOTICE TO PROCEED

Dated: _____

TO: _____

ADDRESS: _____

CITY'S PROJECT NO. B27-13

PROJECT: Taxiway Construction Project, Concord Municipal Airport

CITY'S CONTRACT NO.: B27-13

CONTRACT FOR: Taxiway Construction Project, Concord Municipal Airport

(Name of Contractor)

You are notified that you are to start performing your obligations under the Contract Documents within **ten (10) calendar days** of the date of this Notice to Proceed. In accordance with the Agreement, the date of completion shall be not later than **sixty (60) calendar days thereafter**.

Before you may start any Work at the site the General Terms and Conditions provides that you must deliver to the CITY:

1. Certificates of insurance which you are required to purchase and maintain in accordance with the Contract Documents.
2. A Payment Bond in the amount of 100% of the contract price.
3. A Performance Bond in the amount of 100% of the contract price.

CITY OF CONCORD, NEW HAMPSHIRE
(CITY)

By _____
(Authorized Representative)

Douglas B. Ross, Purchasing Manager
(NAME/TITLE)

COPY TO COMMUNITY DEVELOPMENT DEPARTMENT, ENGINEERING SERVICES

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NOTICE OF AWARD

Dated _____, 2013

TO: _____

ADDRESS: _____

CITY'S PROJECT NO. B27-13

PROJECT: Taxiway Construction Project, Concord Municipal Airport

CITY'S CONTRACT NO.: B27-13

CONTRACT FOR: Taxiway Construction Project, Concord Municipal Airport

You are notified that your Bid dated _____, 2013 for the above Contract has been considered. You are the apparent successful bidder and have been awarded a contract for the CITY'S B27-13, Taxiway Construction Project, Concord Municipal Airport. All terms, conditions, specifications and prices shall be in accordance with the CITY'S bid documents, B27-13 and all addenda, and the CONTRACTOR'S bid opened and publicly read on _____, 2013.

The Contract Price of your contract shall be:

_____ Dollars (\$ _____).
Written Figures

One original of the Agreement accompanies this Notice of Award.

You must comply with the following conditions precedent within ten (10) calendar days of the date of this Notice of Award, which is by _____, 2013. You must deliver to the CITY:

1. One fully executed counterpart of the Agreement;
2. The Contract Security (separate 100 % Payment and Performance Bonds) and Insurance Certificate(s) as specified by B27-13; and
3. (List other conditions precedent)

Failure to comply with these conditions within the time specified will entitle the **CITY** to consider your bid abandoned, to annul this Notice of Award and to declare your bid security forfeited.

Within ten (10) calendar days after you comply with these conditions, the **CITY** will return to you one fully signed counterpart of the Agreement and issue a Notice to Proceed and Purchase Order and return your bid bond security.

CITY OF CONCORD, NEW HAMPSHIRE
(CITY)

BY _____
(AUTHORIZED SIGNATURE)

Douglas B. Ross, Purchasing Manager
(NAME/TITLE)

Copy to COMMUNITY DEVELOPMENT DEPARTMENT, ENGINEERING SERVICES

FAA PROVISIONS FOR AIP PROJECTS

1. The following applies to ALL AIP construction contracts and Subcontracts:

A. AIRPORT AND AIRWAY IMPROVEMENT ACT OF 1982, SECTION 520 – GENERAL CIVIL RIGHTS PROVISIONS

The contractor assures that it will comply with pertinent statutes, Executive orders and such rules as are promulgated to assure that no person shall, on the grounds of race, creed, color, national origin, sex, age, or handicap be excluded from participating in any activity conducted with or benefiting from Federal assistance. This provision obligates the tenant/ concessionaire/ lessee or its transferee for the period during which Federal assistance is extended to the airport a program, except where Federal assistance is to provide, or is in the form of personal property or real property or interest therein or structures or improvements thereon. In these cases the provision obligates the party or any transferee for the longer of the following periods: (a) the period during which the property is used by the airport sponsor or any transferee for a purpose for which Federal assistance is extended, or for another purpose involving the provision of similar services or benefits or (b) the period during which the airport sponsor or any transferee retains ownership or possession of the property. In the case of contractors, this provision binds the contractors from the bid solicitation period through the completion of the contract. This provision is in addition to that required of Title VI of the Civil Rights Act of 1964.

B. BREACH OF CONTRACT TERMS

Any violation or breach of terms of this contract on the part of the contractor or their subcontractors may result in the suspension or termination of this contract or such other action that may be necessary to enforce the rights of the parties of this agreement. The duties and obligations imposed by the Contract Documents and the rights and remedies available thereunder shall be in addition to and not a limitation of any duties, obligations, rights and remedies otherwise imposed or available by law.

C. BUY AMERICAN PREFERENCES

1. The Aviation Safety and Capacity Expansion Act of 1990 provides that preference be given to steel and manufactured products produced in the United States when funds are expended pursuant to a grant issued under the Airport Improvement Program. The following terms apply:

- a. Steel and manufactured products. As used in this clause, steel and manufactured products include (1) steel produced in the United States or (2) a manufactured product produced in the United States, if the cost of its components mined, produced or manufactured in the United States exceeds 60 percent of the cost of all its components and final assembly has taken place in the United States. Components of foreign origin of the same class or kind as the products referred to in subparagraphs b. (1) or (2) shall be treated as domestic.
- b. Components. As used in this clause, components means those articles, materials, and supplies incorporated directly into steel and manufactured products.
- c. Cost of Components. This means the costs for production of the components, exclusive of final assembly labor costs.

2. The successful bidder will be required to assure that only domestic steel and manufactured products will be used by the Contractor, subcontractors, material, men and suppliers in the performance of this contract, except those:

- a. that the US Department of Transportation has determined, under the Aviation Safety and Capacity Expansion Act of 1990, are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality;
- b. that the US Department of Transportation has determined, under the Aviation Safety and Capacity Expansion Act of 1990, that domestic preference would be inconsistent with the public interest; or
- c. that inclusion of domestic material will increase the cost of the overall project contract by more than 25 percent.

D. DISADVANTAGED BUSINESS ENTERPRISES

Contract Assurance (§26.13) - The contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this on tract or such other remedy, as the recipient deems appropriate.

E. ENERGY CONSERVATION REQUIREMENTS

The contractor agrees to comply with mandatory standards and policies relating to energy efficiency that are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act (Public Law 94-163)

F. RIGHTS TO INVENTIONS

All rights to inventions and materials generated under this contract are subject to regulations issued by the FAA and the Sponsor of the Federal grant under which this contract is executed.

G. LOBBYING AND INFLUENCING FEDERAL EMPLOYEES

1. No Federal appropriated funds shall be paid, by or on behalf of the contractor, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the making of any Federal grant and the amendment or modification of any Federal grant.

2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with any Federal grant, the contractor shall complete and submit Standard Form-LLL, "Disclosure of Lobby Activities," in accordance with its instructions.

H. ACCESS TO RECORDS AND REPORTS

The Contractor shall maintain an acceptable cost accounting system. The Contractor agrees to provide the Sponsor, the Federal Aviation Administration and the Comptroller General of the United States or any of their duly authorized representatives access to any books, documents, papers, and records of the contractor which are directly pertinent to the specific contract for the purpose of making audit, examination, excerpts and transcriptions. The Contractor agrees to maintain all books, records and reports required under this contract for a period of not less than three years after final payment is made and all pending matters are closed.

I. CIVIL RIGHTS ACT OF 1964, TITLE VI – CONTRACTOR CONTRACTUAL REQUIREMENTS

During the performance of this contract, the contractor, for itself, its assignees and successors in interest (hereinafter referred to as the "contractor") agrees as follows:

1. Compliance with Regulations. The contractor shall comply with the Regulations relative to nondiscrimination in federally assisted programs of the Department of Transportation (hereinafter, "DOT") Title 49, Code of Federal Regulations, Part 21, as they may be amended from time to time (hereinafter referred to as the Regulations), which are herein incorporated by reference and made a part of this contract.

2. Nondiscrimination. The contractor, with regard to the work performed by it during the contract, shall not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor shall not participate either directly or indirectly in the discrimination prohibited by section 21.5 of the Regulations, including employment practices when the contract covers a program set forth in Appendix B of the Regulations.

3. Solicitations for Subcontracts, Including Procurements of Materials and Equipment. In all solicitations either by competitive bidding or negotiation made by the contractor for work to be performed under a subcontract, including procurements of materials or leases of equipment, each potential subcontractor or supplier shall be notified by the contractor of the contractor's obligations under this contract and the Regulations relative to nondiscrimination on the grounds of race, color, or national origin.

4. Information and Reports. The contractor shall provide all information and reports required by the Regulations or directives issued pursuant thereto and shall permit access to its books, records, accounts, other sources of information and its facilities as may be determined by the Sponsor or the Federal Aviation Administration (FAA) to be pertinent to ascertain compliance with such Regulations, orders, and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish this information, the contractor shall so certify to the sponsor or the FAA, as appropriate, and shall set forth what efforts it has made to obtain the information.

5. Sanctions for Noncompliance. In the event of the contractor's noncompliance with the nondiscrimination provisions of this contract, the sponsor shall impose such contract sanctions as it or the FAA may determine to be appropriate, including, but not limited to:

- a. Withholding of payments to the contractor under the contract until the contractor complies, and/or
- b. Cancellation, termination, or suspension of the contract, in whole or in part.

6. Incorporation of Provisions. The contractor shall include the provisions of paragraphs 1 through 5 in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Regulations or directives issued pursuant thereto. The contractor shall take such action with respect to any subcontract or procurement as the sponsor or the FAA may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, however, that in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or supplier as a result of such direction, the contractor may request the Sponsor to enter into such litigation to protect the interests of the sponsor and, in addition, the contractor may request the United States to enter into such litigation to protect the interests of the United States.

J. TRADE RESTRICTION CLAUSE

The contractor or subcontractor, by submission of an offer and/or execution of a contract, certifies that it:

1. is not owned or controlled by one or more citizens of a foreign country included in the list of countries that discriminate against U.S. firms published by the Office of the United States Trade Representative (USTR);
2. has not knowingly entered into any contract or subcontract for this project with a person that is a citizen or national of a foreign country on said list, or is owned or controlled directly or indirectly by one or more citizens or nationals of a foreign country on said list;
3. has not procured any product nor subcontracted for the supply of any product for use on the project that is produced in a foreign country on said list.

Unless the restrictions of this clause are waived by the Secretary of Transportation in accordance with 49 CFR 30.17, no contract shall be awarded to a contractor or subcontractor who is unable to certify to the above. If the contractor knowingly procures or subcontracts for the supply of any product or service of a foreign country on said list for use on the project, the Federal Aviation Administration may direct through the Sponsor cancellation of the contract at no cost to the Government.

Further, the contractor agrees that, if awarded a contract resulting from this solicitation, it will incorporate this provision for certification without modification in each contract and in all lower tier subcontracts. The contractor may rely on the certification of a prospective subcontractor unless it has knowledge that the certification is erroneous.

The contractor shall provide immediate written notice to the sponsor if the contractor learns that its certification or that of a subcontractor was erroneous when submitted or has become erroneous by reason of changed circumstances. The subcontractor agrees to provide written notice to the contractor if at any time it learns that its certification was erroneous by reason of changed circumstances.

This certification is a material representation of fact upon which reliance was placed when making the award. If it is later determined that the contractor or subcontractor knowingly rendered an erroneous certification, the Federal Aviation Administration may direct through the Sponsor cancellation of the contract or subcontract for default at no cost to the Government.

Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by this provision. The knowledge and information of a contractor is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

This certification concerns a matter within the jurisdiction of an agency of the United States of America and the making of a false, fictitious, or fraudulent certification may render the maker subject to prosecution under Title 18, United States Code, Section 1001.

K. VETERAN'S PREFERENCE

In the employment of labor (except in executive, administrative, and supervisory positions), preference shall be given to Veterans of the Vietnam era and disabled veterans as defined in Section 515(c)(1) and (2) of the Airport and Airway Improvement Act of 1982. However, this preference shall apply only where the individuals are available and qualified to perform the work to which the employment relates.

2. The following applies to ALL AIP construction contracts and subcontracts in excess of \$2,000:

A. DAVIS BACON REQUIREMENTS

1. Minimum Wages

(i) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by the Secretary of Labor under the Copeland Act (29 CFR Part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalent thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR Part 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: *Provided*, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under (1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can easily be seen by the workers.

(ii)(A) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

- (1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and
- (2) The classification is utilized in the area by the construction industry; and
- (3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, D.C. 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (1)(ii) (B) or (C) of this paragraph, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, *Provided*, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

2. Withholding.

The Federal Aviation Administration or the Sponsor shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of work, all or part of the wages required by the contract, the Federal Aviation Administration may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

3. Payrolls and basic records.

(i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program

has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual costs incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)(A) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the (write in name of appropriate federal agency) if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant, sponsor, or owner, as the case may be, for transmission to the (write in name of agency). The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (*e.g.*, the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the (write in name of appropriate federal agency) if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit them to the applicant, sponsor, or owner, as the case may be, for transmission to the (write in name of agency), the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the sponsoring government agency (or the applicant, sponsor, or owner).

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under § 5.5(a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under § 5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(2) That each laborer and mechanic (including each helper, apprentice and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations 29 CFR Part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 231 of Title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph (3)(i) of this section available for inspection, copying or transcription by authorized representatives of the Sponsor, the Federal Aviation Administration or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency may, after written notice to

the contractor, sponsor, applicant or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

4. Apprentices and Trainees.

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State Apprenticeship Agency recognized by the Bureau, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Bureau of Apprenticeship and Training, or a State Apprenticeship Agency recognized by the Bureau, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal Employment Opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

5. Compliance With Copeland Act Requirements.

The contractor shall comply with the requirements of 29 CFR Part 3, which are incorporated by reference in this contract.

6. Subcontracts.

The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR Part 5.5(a)(1) through (10) and such other clauses as the Federal Aviation Administration may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR Part 5.5.

7. Contract Termination: Debarment.

A breach of the contract clauses in paragraph 1 through 10 of this section may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance With Davis-Bacon and Related Act Requirements.

All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract.

9. Disputes Concerning Labor Standards.

Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6 and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. Certification of Eligibility.

(i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

3. The following applies to ALL AIP construction contracts and subcontracts in excess of \$10,000:

A. NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION - 41 CFR PART 60-2

1. The Offeror's or Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Opportunity Construction Contract Specifications" set forth herein.

2. The goals and timetables for minority and female participation, expressed in percentage terms for the contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

Timetables

Goals for minority participation for each trade 0.5%
Goals for female participation in each trade 6.9%

These goals are applicable to all the contractor's construction work (whether or not it is Federal or federally-assisted) performed in the covered area. If the contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the contractor also is subject to the goals for both its Federally involved and non-federally involved construction.

The contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts to meet the goals. The hours of minority and female employment and training shall be substantially uniform throughout the length of the contract, and in each trade, and the contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from contractor to contractor or from project to project, for the sole purpose of meeting the contractor's goals, shall be a violation of the contract, the Executive Order, and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

3. The contractor shall provide written notification to the Director, OFCCP, within 10 working days of award of any construction subcontract in excess of \$10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address, and telephone number of the subcontractor; employer identification number of the subcontractor; estimated dollar amount of the subcontract; estimated starting and completion dates of subcontract; and the geographical area in which the subcontract is to be performed.

4. As used in this notice and in the contract resulting from this solicitation, the "covered area" is NON-SMSA, NH, Merrimack County.

B. EQUAL EMPLOYMENT OPPORTUNITY - 41 CFR PART 60-1.4(b)

During the performance of this contract, the contractor agrees as follows:

1. The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, or national origin. Such action shall include, but not be limited to the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

2. The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive considerations for employment without regard to race, color, religion, sex, or national origin.

3. The contractor will send to each labor union or representative of workers with which s/he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

4. The contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, as amended, and of the rules, regulations, and relevant orders of the Secretary of Labor.

5. The contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

6. In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts or federally assisted

construction contracts in accordance with procedure authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

7. The contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provision, including sanctions for noncompliance: *Provided, however*, that in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency the contractor may request the United States to enter into such litigation to protect the interests of the United States.

**C. STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONSTRUCTION
CONTRACT SPECIFICATIONS - 41 CFR Part 60.4.3**

1. As used in these specifications:

- a. "Covered area" means the geographical area described in the solicitation from which this contract resulted;
- b. "Director" means Director, Office of Federal Contract Compliance Programs (OFCCP), U.S. Department of Labor, or any person to whom the Director delegates authority;
- c. "Employer identification number" means the Federal social security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941;
- d. "Minority" includes:
 - (1) Black (all) persons having origins in any of the Black African racial groups not of Hispanic origin);
 - (2) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin regardless of race);
 - (3) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and
 - (4) American Indian or Alaskan native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).

2. Whenever the contractor, or any subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of \$10,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.

3. If the contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors shall be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each contractor or subcontractor participating in an approved plan is individually required to comply with its obligations under the EEO clause and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other contractors or subcontractors toward a goal in an approved Plan does not excuse any covered contractor's or subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.

4. The contractor shall implement the specific affirmative action standards provided in paragraphs 7a through 7p of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed

as percentages of the total hours of employment and training of minority and female utilization the contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. Covered construction contractors performing construction work in a geographical area where they do not have a Federal or federally assisted construction contract shall apply the minority and female goals established for the geographical area where the work is being performed. Goals are published periodically in the Federal Register in notice form, and such notices may be obtained from any Office of Federal Contract Compliance Programs office or from Federal procurement contracting officers. The contractor is expected to make substantially uniform progress in meeting its goals in each craft during the period specified.

5. Neither the provisions of any collective bargaining agreement nor the failure by a union with whom the contractor has a collective bargaining agreement to refer either minorities or women shall excuse the contractor's obligations under these specifications, Executive Order 11246 or the regulations promulgated pursuant thereto.

6. In order for the non-working training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees shall be employed by the contractor during the training period and the contractor shall have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees shall be trained pursuant to training programs approved by the U.S. Department of Labor.

7. The contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The contractor shall document these efforts fully and shall implement affirmative action steps at least as extensive as the following:

- a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the contractor's employees are assigned to work. The contractor, where possible, will assign two or more women to each construction project. The contractor shall specifically ensure that all foremen, superintendents, and other onsite supervisory personnel are aware of and carry out the contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.
- b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.
- c. Maintain a current file of the names, addresses, and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source, or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the contractor by the union or, if referred, not employed by the contractor, this shall be documented in the file with the reason therefore along with whatever additional actions the contractor may have taken.
- d. Provide immediate written notification to the Director when the union or unions with which the contractor has a collective bargaining agreement has not referred to the contractor a minority person or female sent by the contractor, or when the contractor has other information that the union referral process has impeded the contractor's efforts to meet its obligations.
- e. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the contractor's employment needs, especially those programs funded or approved by the Department of Labor. The contractor shall provide notice of these programs to the sources compiled under 7b above.
- f. Disseminate the contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

- g. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination, or other employment decisions including specific review of these items with onsite supervisory personnel such as superintendents, general foremen, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.
 - h. Disseminate the contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the contractor's EEO policy with other contractors and subcontractors with whom the contractor does or anticipates doing business.
 - i. Direct its recruitment efforts, both oral and written, to minority, female, and community organizations, to schools with minority and female students; and to minority and female recruitment and training organizations serving the contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the contractor shall send written notification to organizations, such as the above, describing the openings, screening procedures, and tests to be used in the selection process.
 - j. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable provide after school, summer, and vacation employment to minority and female youth both on the site and in other areas of a contractor's workforce.
 - k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.
 - l. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel, for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.
 - m. Ensure that seniority practices, job classifications, work assignments, and other personnel practices do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the contractor's obligations under these specifications are being carried out.
 - n. Ensure that all facilities and company activities are non-segregated except that separate or single user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.
 - o. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.
 - p. Conduct a review, at least annually, of all supervisor's adherence to and performance under the contractor's EEO policies and affirmative action obligations.
8. Contractors are encouraged to participate in voluntary associations, which assist in fulfilling one or more of their affirmative action obligations (7a through 7p above). The efforts of a contractor association, joint contractor union, contractor community, or other similar groups of which the contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under 7a through 7p of these specifications provided that the contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the contractor's minority and female workforce participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the contractor. The obligation to comply, however, is the contractor's and failure of such a group to fulfill an obligation shall not be a defense for the contractor's noncompliance.
9. A single goal for minorities and a separate single goal for women have been established. The contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, if the particular

group is employed in a substantially disparate manner (for example, even though the contractor has achieved its goals for women generally,) the contractor may be in violation of the Executive Order if a specific minority group of women is underutilized.

10. The contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.

11. The contractor shall not enter into any subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.

12. The contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination, and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.

13. The contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 18.7 of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.

14. The contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government, and to keep records. Records shall at least include for each employee, the name, address, telephone number, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.

15. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

D. CERTIFICATION OF NONSEGREGATED FACILITIES - 41 CFR PART 60-1.8

Notice to Prospective Federally Assisted Construction Contractors

1. A Certification of Non-segregated Facilities shall be submitted prior to the award of a federally-assisted construction contract exceeding \$10,000 which is not exempt from the provisions of the Equal Opportunity Clause.

2. Contractors receiving federally-assisted construction contract awards exceeding \$10,000 which are not exempt from the provisions of the Equal Opportunity Clause will be required to provide for the forwarding of the following notice to prospective subcontractors for supplies and construction contracts where the subcontracts exceed \$10,000 and are not exempt from the provisions of the Equal Opportunity Clause. NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

Notice to Prospective Subcontractors of Requirements for Certification of Non-Segregated Facilities

1. A Certification of Non-segregated Facilities shall be submitted prior to the award of a subcontract exceeding \$10,000, which is not exempt from the provisions of the Equal Opportunity Clause.

2. Contractors receiving subcontract awards exceeding \$10,000 which are not exempt from the provisions of the Equal Opportunity Clause will be required to provide for the forwarding of this notice to prospective subcontractors for supplies and construction contracts where the subcontracts exceed \$10,000 and are not

exempt from the provisions of the Equal Opportunity Clause. NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

E. TERMINATION OF CONTRACT – Title 49 CFR Part 18.36

1. The Sponsor may, by written notice, terminate this contract in whole or in part at any time, either for the Sponsor's convenience or because of failure to fulfill the contract obligations. Upon receipt of such notice services shall be immediately discontinued (unless the notice directs otherwise) and all materials as may have been accumulated in performing this contract, whether completed or in progress, delivered to the Sponsor.
2. If the termination is for the convenience of the Sponsor, an equitable adjustment in the contract price shall be made, but no amount shall be allowed for anticipated profit on unperformed services.
3. If the termination is due to failure to fulfill the contractor's obligations, the Sponsor may take over the work and prosecute the same to completion by contract or otherwise. In such case, the contractor shall be liable to the Sponsor for any additional cost occasioned to the Sponsor thereby.
4. If, after notice of termination for failure to fulfill contract obligations, it is determined that the contractor had not so failed, the termination shall be deemed to have been effected for the convenience of the Sponsor. In such event, adjustment in the contract price shall be made as provided in paragraph 2 of this clause.
5. The rights and remedies of the sponsor provided in this clause are in addition to any other rights and remedies provided by law or under this contract.

4. The following applies to ALL AIP construction contracts and subcontracts in excess of \$25,000:

A. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

The bidder/offeror certifies, by submission of this proposal or acceptance of this contract, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency. It further agrees by submitting this proposal that it will include this clause without modification in all lower tier transactions, solicitations, proposals, contracts, and subcontracts. Where the bidder/offeror/contractor or any lower tier participant is unable to certify to this statement, it shall attach an explanation to this solicitation/proposal.

5. The following applies to ALL AIP construction contracts and subcontracts in excess of \$100,000:

A. CLEAN AIR AND WATER POLLUTION CONTROL

Contractors and subcontractors agree:

1. That any facility to be used in the performance of the contract or subcontract or to benefit from the contract is not listed on the Environmental Protection Agency (EPA) List of Violating Facilities;
2. To comply with all the requirements of Section 114 of the Clean Air Act, as amended, 42 U.S.C. 1857 et seq. and Section 308 of the Federal Water Pollution Control Act, as amended, 33 U.S.C. 1251 et seq. relating to inspection, monitoring, entry, reports, and information, as well as all other requirements specified in Section 114 and Section 308 of the Acts, respectively, and all other regulations and guidelines issued there under;
3. That, as a condition for the award of this contract, the contractor or subcontractor will notify the awarding official of the receipt of any communication from the EPA indicating that a facility to be used for the performance of or benefit from the contract is under consideration to be listed on the EPA List of Violating Facilities;
4. To include or cause to be included in any construction contract or subcontract, which exceeds \$ 100,000 the aforementioned criteria and requirements.

B. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT REQUIREMENTS 29 CFR PART 5

1. Overtime Requirements.

No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic, including watchmen and guards, in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

2. Violation; Liability for Unpaid Wages; Liquidated Damages.

In the event of any violation of the clause set forth in paragraph (1) above, the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph 1 above, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph 1 above.

3. Withholding for Unpaid Wages and Liquidated Damages.

The Federal Aviation Administration or the Sponsor shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any monies payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph 2 above.

4. Subcontractors.

The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraphs 1 through 4 and also a clause requiring the subcontractor to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs 1 through 4 of this section.

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FEDERAL WAGE RATES

General Decision Number: NH130030 01/04/2013 NH30

Superseded General Decision Number: NH20120030

State: New Hampshire

Construction Type: Highway

County: Merrimack County in New Hampshire.

HIGHWAY CONSTRUCTION PROJECTS (excluding tunnels, building structures in rest area projects & railroad construction; bascule, suspension & spandrel arch bridges designed for commercial navigation, bridges involving marine construction; and other major bridges).

Modification Number	Publication Date
0	01/04/2013

* SUNH2011-026 08/15/2011

	Rates	Fringes
CARPENTER (Excluding Form Work).....	\$ 24.63	3.45
CARPENTER (Form Work Only).....	\$ 18.63	1.61
CEMENT MASON/CONCRETE FINISHER...	\$ 18.50	0.00
INSTALLER - GUARDRAIL.....	\$ 22.28	8.09
IRONWORKER, REINFORCING.....	\$ 21.59	0.90
LABORER: Common or General.....	\$ 14.73	4.81
LABORER: Flagger.....	\$ 11.79	0.00
LABORER: Highway/Parking Lot Striping.....	\$ 16.38	0.00
OPERATOR: Backhoe.....	\$ 22.08	6.00
OPERATOR: Broom.....	\$ 15.65	2.89
OPERATOR: Bulldozer.....	\$ 20.08	0.00
OPERATOR: Cold Planer.....	\$ 18.42	3.38
OPERATOR: Crane.....	\$ 23.21	3.61
OPERATOR: Excavator.....	\$ 22.21	0.00
OPERATOR: Grader/Blade.....	\$ 23.64	0.53

OPERATOR: Loader.....	\$ 17.83	2.41
OPERATOR: Paver.....	\$ 17.92	5.77
OPERATOR: Roller.....	\$ 16.16	4.91
OPERATOR: Post Driver/Pounder....	\$ 30.73	13.90
TRUCK DRIVER, Includes Dump Trucks/All Axles.....	\$ 17.72	2.60
TRUCK DRIVER: Low Bed Truck.....	\$ 20.60	4.39

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is union or non-union.

Union Identifiers

An identifier enclosed in dotted lines beginning with characters other than "SU" denotes that the union classification and rate have found to be prevailing for that classification. Example: PLUM0198-005 07/01/2011. The first four letters , PLUM, indicate the international union and the four-digit number, 0198, that follows indicates the local union number or district council number where applicable , i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2011, following these characters is the effective date of the most current negotiated rate/collective bargaining agreement which would be July 1, 2011 in the above example.

Union prevailing wage rates will be updated to reflect any changes in the collective bargaining agreements governing the rates.

0000/9999: weighted union wage rates will be published annually each January.

Non-Union Identifiers

Classifications listed under an "SU" identifier were derived from survey data by computing average rates and are not union rates; however, the data used in computing these rates may include both union and non-union data. Example: SULA2004-007 5/13/2010. SU indicates the rates are not union majority rates, LA indicates the State of Louisiana; 2004 is the year of the survey; and 007 is an internal number used in producing the wage determination. A 1993 or later date, 5/13/2010, indicates the classifications and rates under that identifier were issued as a General Wage Determination on that date.

Survey wage rates will remain in effect and will not change until a new survey is conducted.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on a wage determination matter
- * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator

(See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION

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CONTRACT ARTICLES

Section 10 Definition of Terms

Whenever the following terms are used in these specifications, in the contract, or in any documents or other instruments pertaining to construction where these specifications govern, the intent and meaning shall be interpreted as follows:

10-01 AASHTO. The American Association of State Highway and Transportation Officials, the successor association to AASHO.

10-02 ACCESS ROAD. The right-of-way, the roadway and all improvements constructed thereon connecting the airport to a public highway.

10-03 ADVERTISEMENT. A public announcement, as required by local law, inviting bids for work to be performed and materials to be furnished.

10-04 AIP. The Airport Improvement Program, a grant-in-aid program, administered by the Federal Aviation Administration.

10-05 AIR OPERATIONS AREA. For the purpose of these specifications, the term air operations area shall mean any area of the airport used or intended to be used for the landing, takeoff, or surface maneuvering of aircraft. An air operation area shall include such paved or unpaved areas that are used or intended to be used for the unobstructed movement of aircraft in addition to its associated runway, taxiway, or apron.

10-06 AIRPORT. Airport means an area of land or water which is used or intended to be used for the landing and takeoff of aircraft; an appurtenant area used or intended to be used for airport buildings or other airport facilities or rights of way; and airport buildings and facilities located in any of these areas, and includes a heliport.

10-07 ASTM. The American Society for Testing and Materials.

10-08 AWARD. The acceptance, by the Owner, of the successful bidder's proposal.

10-09 BIDDER. Any individual, partnership, firm, or corporation, acting directly or through a duly authorized representative, who submits a proposal for the work contemplated.

10-10 BUILDING AREA. An area on the airport to be used, considered, or intended to be used for airport buildings or other airport facilities or rights-of-way together with all airport buildings and facilities located thereon.

10-11 CALENDAR DAY. Every day shown on the calendar.

10-12 CHANGE ORDER. A written order to the Contractor covering changes in the plans, specifications, or proposal quantities and establishing the basis of payment and contract time adjustment, if any, for the work affected by such changes. The work, covered by a change order, shall be within the scope of the contract.

10-13 CONTRACT. The written agreement covering the work to be performed. The awarded contract shall include, but is not limited to: The Advertisement; The Contract Form; The Proposal; The Performance Bond; The Payment Bond; any required insurance certificates; The Specifications; The Plans, and any addenda issued to bidders.

10-14 CONTRACT ITEM (PAY ITEM). A specific unit of work for which a price is provided in the contract.

10-15 CONTRACT TIME. The number of calendar days or working days, stated in the proposal, allowed for completion of the contract, including authorized time extensions. If a calendar date of completion is stated in the proposal, in lieu of a number of calendar or working days, the contract shall be completed by that date.

10-16 CONTRACTOR. The individual, partnership, firm, or corporation primarily liable for the acceptable performance of the work contracted and for the payment of all legal debts pertaining to the work who acts directly or through lawful agents or employees to complete the contract work.

10-17 DRAINAGE SYSTEM. The system of pipes, ditches, and structures by which surface or subsurface waters are collected and conducted from the airport area.

10-18 ENGINEER. The individual, partnership, firm, or corporation duly authorized by the Owner to be responsible for engineering inspection of the contract work and acting directly or through an authorized representative.

10-19 EQUIPMENT. All machinery, together with the necessary supplies for upkeep and maintenance, and also all tools and apparatus necessary for the proper construction and acceptable completion of the work.

10-20 EXTRA WORK. An item of work not provided for in the awarded contract as previously modified by change order or supplemental agreement, but which is found by the Engineer to be necessary to complete the work within the intended scope of the contract as previously modified.

10-21 FAA. The Federal Aviation Administration of the U.S. Department of Transportation. When used to designate a person, FAA shall mean the Administrator or his/her duly authorized representative.

10-22 FEDERAL SPECIFICATIONS. The Federal Specifications and Standards, Commercial Item Descriptions, and supplements, amendments, and indices thereto are prepared and issued by the General Services Administration of the Federal Government.

10-23 FORCE ACCOUNT. Force account construction work is construction that is accomplished through the use of material, equipment, labor, and supervision provided by the Owner or by another public agency pursuant to an agreement with the Owner.

10-24 INSPECTOR. An authorized representative of the Engineer assigned to make all necessary inspections and/or tests of the work performed or being performed, or of the materials furnished or being furnished by the Contractor.

10-25 INTENTION OF TERMS. Whenever, in these specifications or on the plans, the words “directed,” “required,” “permitted,” “ordered,” “designated,” “prescribed,” or words of like import are used, it shall be understood that the direction, requirement, permission, order, designation, or prescription of the Engineer is intended; and similarly, the words “approved,” “acceptable,” “satisfactory,” or words of like import, shall mean approved by, or acceptable to, or satisfactory to the Engineer, subject in each case to the final determination of the Owner.

Any reference to a specific requirement of a numbered paragraph of the contract specifications or a cited standard shall be interpreted to include all general requirements of the entire section, specification item, or cited standard that may be pertinent to such specific reference.

10-26 LABORATORY. The official testing laboratories of the Owner or such other laboratories as may be designated by the Engineer.

10-27 LIGHTING. A system of fixtures providing or controlling the light sources used on or near the airport or within the airport buildings. The field lighting includes all luminous signals, markers, floodlights, and illuminating devices used on or near the airport or to aid in the operation of aircraft landing at, taking off from, or taxiing on the airport surface.

10-28 MAJOR AND MINOR CONTRACT ITEMS. A major contract item shall be any item that is listed in the proposal, the total cost of which is equal to or greater than 20 percent of the total amount of the award contract. All other items shall be considered minor contract items.

10-29 MATERIALS. Any substance specified for use in the construction of the contract work.

10-30 NOTICE TO PROCEED. A written notice to the Contractor to begin the actual contract work on a previously agreed to date. If applicable, the Notice to Proceed shall state the date on which the contract time begins.

10-31 OWNER. The term “Owner” shall mean the party of the first part or the contracting agency signatory to the contract. For AIP contracts, the term “sponsor” shall have the same meaning as the term “Owner.” Where the term “Owner” is capitalized in this document, it shall mean airport owner or sponsor only.

10-32 PAVEMENT. The combined surface course, base course, and subbase course, if any, considered as a single unit.

10-33 PAYMENT BOND. The approved form of security furnished by the Contractor and his/her surety as a guaranty that he will pay in full all bills and accounts for materials and labor used in the construction of the work.

10-34 PERFORMANCE BOND. The approved form of security furnished by the Contractor and his/her surety as a guaranty that the Contractor will complete the work in accordance with the terms of the contract.

10-35 PLANS. The official drawings or exact reproductions which show the location, character, dimensions and details of the airport and the work to be done and which are to be considered as a part of the contract, supplementary to the specifications.

10-36 PROJECT. The agreed scope of work for accomplishing specific airport development with respect to a particular airport.

10-37 PROPOSAL. The written offer of the bidder (when submitted on the approved proposal form) to perform the contemplated work and furnish the necessary materials in accordance with the provisions of the plans and specifications.

10-38 PROPOSAL GUARANTY. The security furnished with a proposal to guarantee that the bidder will enter into a contract if his/her proposal is accepted by the Owner.

10-39 RUNWAY. The area on the airport prepared for the landing and takeoff of aircraft.

10-40 SPECIFICATIONS. A part of the contract containing the written directions and requirements for completing the contract work. Standards for specifying materials or testing which are cited in the contract specifications by reference shall have the same force and effect as if included in the contract physically.

10-41 SPONSOR. See definition above of "Owner."

10-42 STRUCTURES. Airport facilities such as bridges; culverts; catch basins, inlets, retaining walls, cribbing; storm and sanitary sewer lines; water lines; underdrains; electrical ducts, manholes, handholes, lighting fixtures and bases; transformers; flexible and rigid pavements; navigational aids; buildings; vaults; and, other manmade features of the airport that may be encountered in the work and not otherwise classified herein.

10-43 SUBGRADE. The soil that forms the pavement foundation.

10-44 SUPERINTENDENT. The Contractor's executive representative who is present on the work during progress, authorized to receive and fulfill instructions from the Engineer, and who shall supervise and direct the construction.

10-45 SUPPLEMENTAL AGREEMENT. A written agreement between the Contractor and the Owner covering (1) work that would increase or decrease the total amount of the awarded contract, or any major contract item, by more than 25 percent, such increased or decreased work being within the scope of the originally awarded contract; or (2) work that is not within the scope of the originally awarded contract.

10-46 SURETY. The corporation, partnership, or individual, other than the Contractor, executing payment or performance bonds that are furnished to the Owner by the Contractor.

10-47 TAXIWAY. For the purpose of this document, the term taxiway means the portion of the air operations area of an airport that has been designated by competent airport authority for movement of aircraft to and from the airport's runways or aircraft parking areas.

10-48 WORK. The furnishing of all labor, materials, tools, equipment, and incidentals necessary or convenient to the Contractor's performance of all duties and obligations imposed by the contract, plans, and specifications.

10-49 WORKING DAY. A working day shall be any day other than a legal holiday, Saturday, or Sunday on which the normal working forces of the Contractor may proceed with regular work for at least 6 hours toward completion of the contract. When work is suspended for causes beyond the Contractor's control, Saturdays, Sundays and holidays on which the Contractor's forces engage in regular work, requiring the presence of an inspector, will be considered as working days.

END OF SECTION 10

Section 20 Proposal Requirements and Conditions

20-01 ADVERTISEMENT. Refer to Invitation to Bid.

20-02 PREQUALIFICATION OF BIDDERS. Each bidder shall furnish the owner satisfactory evidence of his/her competency to perform the proposed work. Such evidence of competency, unless otherwise specified, shall consist of statements covering the bidder's past experience on similar work, a list of equipment that would be available for the work, and a list of key personnel that would be available. In addition, each bidder shall furnish the owner satisfactory evidence of his/her financial responsibility. Such evidence of financial responsibility, unless otherwise specified, shall consist of a confidential statement or report of the bidder's financial resources and liabilities as of the last calendar year or the Contractor's last fiscal year. Such statements or reports shall be certified by a public accountant. At the time of submitting such financial statements or reports, the bidder shall further certify whether his/her financial responsibility is approximately the same as stated or reported by the public accountant. If the bidder's financial responsibility has changed, the bidder shall qualify the public accountant's statement or report to reflect his/her (bidder's) true financial condition at the time such qualified statement or report is submitted to the Owner.

Unless otherwise specified, a bidder may submit evidence that he is prequalified with the State Highway Division and is on the current "bidder's list" of the state in which the proposed work is located. Such evidence of State Highway Division prequalification may be submitted as evidence of financial responsibility in lieu of the certified statements or reports hereinbefore specified.

Each bidder shall submit "evidence of competency" and "evidence of financial responsibility" to the Owner at the time of bid opening.

20-03 CONTENTS OF PROPOSAL FORMS. The Owner shall furnish bidders with proposal forms. All papers bound with or attached to the proposal forms are necessary parts and must not be detached.

The plans specifications, and other documents designated in the proposal form shall be considered a part of the proposal whether attached or not.

20-04 ISSUANCE OF PROPOSAL FORMS. The Owner reserves the right to refuse to issue a proposal form to a prospective bidder should such bidder be in default for any of the following reasons:

- a. Failure to comply with any prequalification regulations of the Owner, if such regulations are cited, or otherwise included, in the proposal as a requirement for bidding.
- b. Failure to pay, or satisfactorily settle, all bills due for labor and materials on former contracts in force (with the Owner) at the time the Owner issues the proposal to a prospective bidder.
- c. Contractor default under previous contracts with the Owner.
- d. Unsatisfactory work on previous contracts with the Owner.

20-05 INTERPRETATION OF ESTIMATED PROPOSAL QUANTITIES. An estimate of quantities of work to be done and materials to be furnished under these specifications is given in the proposal. It is the result of careful calculations and is believed to be correct. It is given only as a basis for comparison of proposals and the award of the contract. The Owner does not expressly or by implication agree that the actual quantities involved will correspond exactly therewith; nor shall the bidder plead misunderstanding or deception because of such estimates of quantities, or of the character, location, or other conditions pertaining to the work. Payment to the Contractor will be made only for the actual quantities of work performed or materials furnished in accordance with the plans and specifications. It is understood that the quantities may be increased or decreased as hereinafter provided in the subsection titled ALTERATION OF WORK AND QUANTITIES of Section 40 without in any way invalidating the unit bid prices.

20-06 EXAMINATION OF PLANS, SPECIFICATIONS, AND SITE. The bidder is expected to carefully examine the site of the proposed work, the proposal, plans specifications, and contract forms. He shall satisfy himself as to the character, quality, and quantities of work to be performed, materials to be furnished, and as to the

requirements of the proposed contract. The submission of a proposal shall be prima facie evidence that the bidder has made such examination and is satisfied as to the conditions to be encountered in performing the work and as to the requirements of the proposed contract, plans, and specifications.

Boring logs and other records of subsurface investigations and tests are available for inspection of bidders. It is understood and agreed that such subsurface information, whether included in the plans, specifications, or otherwise made available to the bidder, was obtained and is intended for the Owner's design and estimating purposes only. Such information has been made available for the convenience of all bidders. It is further understood and agreed that each bidder is solely responsible for all assumptions, deductions, or conclusions which he may make or obtain from his/her examination of the boring logs and other records of subsurface investigations and tests that are furnished by the Owner.

20-07 PREPARATION OF PROPOSAL. The bidder shall submit his/her proposal on the forms furnished by the Owner. All blank spaces in the proposal forms must be correctly filled in where indicated for each and every item for which a quantity is given. The bidder shall state the price (written in ink or typed) both in words and numerals for which he proposes to do each pay item furnished in the proposal. In case of conflict between words and numerals, the words, unless obviously incorrect, shall govern.

The bidder shall sign his/her proposal correctly and in ink. If the proposal is made by an individual, his/her name and post office address must be shown. If made by a partnership, the name and post office address of each member of the partnership must be shown. If made by a corporation, the person signing the proposal shall give the name of the state under the laws of which the corporation was chartered and the name, titles, and business address of the president, secretary, and the treasurer. Anyone signing a proposal as an agent shall file evidence of his/her authority to do so and that the signature is binding upon the firm or corporation.

20-08 IRREGULAR PROPOSALS. Proposals shall be considered irregular for the following reasons:

- a. If the proposal is on a form other than that furnished by the Owner, or if the Owner's form is altered, or if any part of the proposal form is detached.
- b. If there are unauthorized additions, conditional or alternate pay items, or irregularities of any kind that make the proposal incomplete, indefinite, or otherwise ambiguous.
- c. If the proposal does not contain a unit price for each pay item listed in the proposal, except in the case of authorized alternate pay items, for which the bidder is not required to furnish a unit price.
- d. If the proposal contains unit prices that are obviously unbalanced.
- e. If the proposal is not accompanied by the proposal guaranty specified by the Owner.

The Owner reserves the right to reject any irregular proposal and the right to waive technicalities if such waiver is in the best interest of the Owner and conforms to local laws and ordinances pertaining to the letting of construction contracts.

20-09 BID GUARANTEE. Each separate proposal shall be accompanied by a certified check, or other specified acceptable collateral, in the amount specified in the proposal form. Such check, or collateral, shall be made payable to the Owner.

20-10 DELIVERY OF PROPOSAL. Each proposal submitted shall be placed in a sealed envelope plainly marked with the project number, location of airport, and name and business address of the bidder on the outside. When sent by mail, preferably registered, the sealed proposal, marked as indicated above, should be enclosed in an additional envelope. No proposal will be considered unless received at the place specified in the advertisement before the time specified for opening all bids. Proposals received after the bid opening time shall be returned to the bidder unopened.

20-11 WITHDRAWAL OR REVISION OF PROPOSALS. A bidder may withdraw or revise (by withdrawal of one proposal and submission of another) a proposal provided that the bidder's request for withdrawal is received by the Owner in writing or by telegram before the time specified for opening bids. Revised proposals must be received at the place specified in the advertisement before the time specified for opening all bids.

20-12 PUBLIC OPENING OF PROPOSALS. Proposals shall be opened, and read, publicly at the time and place specified in the advertisement. Bidders, their authorized agents, and other interested persons are invited to attend.

Proposals that have been withdrawn (by written or telegraphic request) or received after the time specified for opening bids shall be returned to the bidder unopened.

20-13 DISQUALIFICATION OF BIDDERS. A bidder shall be considered disqualified for any of the following reasons:

a. Submitting more than one proposal from the same partnership, firm, or corporation under the same or different name.

b. Evidence of collusion among bidders. Bidders participating in such collusion shall be disqualified as bidders for any future work of the Owner until any such participating bidder has been reinstated by the Owner as a qualified bidder.

c. If the bidder is considered to be in “default” for any reason specified in the subsection titled ISSUANCE OF PROPOSAL FORMS of this section.

END OF SECTION 20

Section 30 Award and Execution of Contract

30-01 CONSIDERATION OF PROPOSALS. After the proposals are publicly opened and read, they will be compared on the basis of the summation of the products obtained by multiplying the estimated quantities shown in the proposal by the unit bid prices. If a bidder's proposal contains a discrepancy between unit bid prices written in words and unit bid prices written in numbers, the unit price written in words shall govern.

Until the award of a contract is made, the Owner reserves the right to reject a bidder's proposal for any of the following reasons:

a. If the proposal is irregular as specified in the subsection titled **IRREGULAR PROPOSALS** of Section 20.

b. If the bidder is disqualified for any of the reasons specified in the subsection titled **DISQUALIFICATION OF BIDDERS** of Section 20.

In addition, until the award of a contract is made, the Owner reserves the right to reject any or all proposals, waive technicalities, if such waiver is in the best interest of the Owner and is in conformance with applicable state and local laws or regulations pertaining to the letting of construction contracts; advertise for new proposals; or proceed with the work otherwise. All such actions shall promote the Owner's best interests.

30-02 AWARD OF CONTRACT. The award of a contract, if it is to be awarded, shall be made within 180 calendar days of the date specified for publicly opening proposals, unless otherwise specified herein.

Award of the contract shall be made by the Owner to the lowest, qualified bidder whose proposal conforms to the cited requirements of the Owner.

30-03 CANCELLATION OF AWARD. The Owner reserves the right to cancel the award without liability to the bidder, except return of proposal guaranty, at any time before a contract has been fully executed by all parties and is approved by the Owner in accordance with the subsection titled **APPROVAL OF CONTRACT** of this section.

30-04 RETURN OF PROPOSAL GUARANTY. All proposal guaranties, except those of the two lowest bidders, will be returned immediately after the Owner has made a comparison of bids as hereinbefore specified in the subsection titled **CONSIDERATION OF PROPOSALS** of this section. Proposal guaranties of the two lowest bidders will be retained by the Owner until such time as an award is made, at which time, the unsuccessful bidder's proposal guaranty will be returned. The successful bidder's proposal guaranty will be returned as soon as the Owner receives the contracts bonds as specified in the subsection titled **REQUIREMENTS OF CONTRACT BONDS** of this section.

30-05 REQUIREMENTS OF CONTRACT BONDS. At the time of the execution of the contract, the successful bidder shall furnish the Owner a surety bond or bonds that have been fully executed by the bidder and the surety guaranteeing the performance of the work and the payment of all legal debts that may be incurred by reason of the Contractor's performance of the work. The surety and the form of the bond or bonds shall be acceptable to the Owner. Unless otherwise specified in this subsection, the surety bond or bonds shall be in a sum equal to the full amount of the contract.

30-06 EXECUTION OF CONTRACT. The successful bidder shall sign (execute) the necessary agreements for entering into the contract and return such signed contract to the owner, along with the fully executed surety bond or bonds specified in the subsection titled **REQUIREMENTS OF CONTRACT BONDS** of this section, within 15 calendar days from the date mailed or otherwise delivered to the successful bidder. If the contract is mailed, special handling is recommended.

49 CFR Part 26 provides that each contract the owner signs with a contractor (and each subcontract the prime contractor signs with a subcontractor) shall include the following assurance:

The contractor, sub-recipient or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of Department of

Transportation (DOT) assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the recipient deems appropriate.

30-07 APPROVAL OF CONTRACT. Upon receipt of the contract and contract bond or bonds that have been executed by the successful bidder, the Owner shall complete the execution of the contract in accordance with local laws or ordinances, and return the fully executed contract to the Contractor. Delivery of the fully executed contract to the Contractor shall constitute the Owner's approval to be bound by the successful bidder's proposal and the terms of the contract.

30-08 FAILURE TO EXECUTE CONTRACT. Failure of the successful bidder to execute the contract and furnish an acceptable surety bond or bonds within the 15 calendar day period specified in the subsection titled REQUIREMENTS OF CONTRACT BONDS of this section shall be just cause for cancellation of the award and forfeiture of the proposal guaranty, not as a penalty, but as liquidation of damages to the Owner.

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Section 40 Scope of Work

40-01 INTENT OF CONTRACT. The intent of the contract is to provide for construction and completion, in every detail, of the work described. It is further intended that the Contractor shall furnish all labor, materials, equipment, tools, transportation, and supplies required to complete the work in accordance with the plans, specifications, and terms of the contract.

40-02 ALTERATION OF WORK AND QUANTITIES. The owner reserves and shall have the right to make such alterations in the work as may be necessary or desirable to complete the work originally intended in an acceptable manner. Unless otherwise specified herein, the Engineer shall be and is hereby authorized to make such alterations in the work as may increase or decrease the originally awarded contract quantities, provided that the aggregate of such alterations does not change the total contract cost or the total cost of any major contract item by more than 25 percent (total cost being based on the unit prices and estimated quantities in the awarded contract). Alterations that do not exceed the 25 percent limitation shall not invalidate the contract nor release the surety, and the Contractor agrees to accept payment for such alterations as if the altered work had been a part of the original contract. These alterations that are for work within the general scope of the contract shall be covered by "Change Orders" issued by the Engineer. Change orders for altered work shall include extensions of contract time where, in the Engineer's opinion, such extensions are commensurate with the amount and difficulty of added work.

Should the aggregate amount of altered work exceed the 25 percent limitation hereinbefore specified, such excess altered work shall be covered by supplemental agreement. If the owner and the Contractor are unable to agree on a unit adjustment for any contract item that requires a supplemental agreement, the owner reserves the right to terminate the contract with respect to the item and make other arrangements for its completion.

40-03 OMITTED ITEMS. The Engineer may, in the Owner's best interest, omit from the work any contract item, except major contract items. Major contract items may be omitted by a supplemental agreement. Such omission of contract items shall not invalidate any other contract provision or requirement.

Should a contract item be omitted or otherwise ordered to be nonperformed, the Contractor shall be paid for all work performed toward completion of such item prior to the date of the order to omit such item. Payment for work performed shall be in accordance with the subsection titled PAYMENT FOR OMITTED ITEMS of Section 90.

40-04 EXTRA WORK. Should acceptable completion of the contract require the Contractor to perform an item of work for which no basis of payment has been provided in the original contract or previously issued change orders or supplemental agreements, the same shall be called "Extra Work." Extra Work that is within the general scope of the contract shall be covered by written change order. Change orders for such Extra Work shall contain agreed unit prices for performing the change order work in accordance with the requirements specified in the order, and shall contain any adjustment to the contract time that, in the Engineer's opinion, is necessary for completion of such Extra Work.

When determined by the Engineer to be in the Owner's best interest, he may order the Contractor to proceed with Extra Work by force account as provided in the subsection titled PAYMENT FOR EXTRA AND FORCE ACCOUNT WORK of Section 90.

Extra Work that is necessary for acceptable completion of the project, but is not within the general scope of the work covered by the original contract shall be covered by a Supplemental Agreement as hereinbefore defined in the subsection titled SUPPLEMENTAL AGREEMENT of Section 10.

Any claim for payment of Extra Work that is not covered by written agreement (change order or supplemental agreement) shall be rejected by the Owner.

40-05 MAINTENANCE OF TRAFFIC. It is the explicit intention of the contract that the safety of aircraft, as well as the Contractor's equipment and personnel, is the most important consideration. It is understood and agreed that the Contractor shall provide for the free and unobstructed movement of aircraft in the air operations areas of the airport with respect to his/her own operations and the operations of all his/her subcontractors as specified in the

subsection titled LIMITATION OF OPERATIONS of Section 80. It is further understood and agreed that the Contractor shall provide for the uninterrupted operation of visual and electronic signals (including power supplies thereto) used in the guidance of aircraft while operating to, from, and upon the airport as specified in the subsection titled CONTRACTOR'S RESPONSIBILITY FOR UTILITY SERVICE AND FACILITIES OF OTHERS in Section 70.

With respect to his/her own operations and the operations of all his/her subcontractors, the Contractor shall provide marking, lighting, and other acceptable means of identifying: personnel; equipment; vehicles; storage areas; and any work area or condition that may be hazardous to the operation of aircraft, fire-rescue equipment, or maintenance vehicles at the airport.

When the contract requires the maintenance of vehicular traffic on an existing road, street, or highway during the Contractor's performance of work that is otherwise provided for in the contract, plans, and specifications, the Contractor shall keep such road, street, or highway open to all traffic and shall provide such maintenance as may be required to accommodate traffic. The Contractor shall furnish erect, and maintain barricades, warning signs, flag person, and other traffic control devices in reasonable conformity with the manual of Uniform Traffic Control Devices for Streets and Highways (published by the United States Government Printing Office), unless otherwise specified herein. The Contractor shall also construct and maintain in a safe condition any temporary connections necessary for ingress to and egress from abutting property or intersecting roads, streets or highways. Unless otherwise specified herein, the Contractor will not be required to furnish snow removal for such existing road, street, or highway.

The Contractor shall make his/her own estimate of all labor, materials, equipment, and incidentals necessary for providing the maintenance of aircraft and vehicular traffic as specified in this subsection.

The cost of maintaining the aircraft and vehicular traffic specified in this subsection shall not be measured or paid for directly, but shall be included in the various contract items.

40-06 REMOVAL OF EXISTING STRUCTURES. All existing structures encountered within the established lines, grades, or grading sections shall be removed by the Contractor, unless such existing structures are otherwise specified to be relocated, adjusted up or down, salvaged, abandoned in place, reused in the work or to remain in place. The cost of removing such existing structures shall not be measured or paid for directly, but shall be included in the various contract items.

Should the Contractor encounter an existing structure (above or below ground) in the work for which the disposition is not indicated on the plans, the Engineer shall be notified prior to disturbing such structure. The disposition of existing structures so encountered shall be immediately determined by the Engineer in accordance with the provisions of the contract.

Except as provided in the subsection titled RIGHTS IN AND USE OF MATERIALS FOUND IN THE WORK of this section, it is intended that all existing materials or structures that may be encountered (within the lines, grades, or grading sections established for completion of the work) shall be used in the work as otherwise provided for in the contract and shall remain the property of the Owner when so used in the work.

40-07 RIGHTS IN AND USE OF MATERIALS FOUND IN THE WORK. Should the Contractor encounter any material such as (but not restricted to) sand, stone, gravel, slag, or concrete slabs within the established lines, grades, or grading sections, the use of which is intended by the terms of the contract to be either embankment or waste, he may at his/her option either:

- a. Use such material in another contract item, providing such use is approved by the Engineer and is in conformance with the contract specifications applicable to such use; or,
- b. Remove such material from the site, upon written approval of the Engineer; or
- c. Use such material for his/her own temporary construction on site; or,
- d. Use such material as intended by the terms of the contract.

Should the Contractor wish to exercise option a., b., or c., he shall request the Engineer's approval in advance of such use.

Should the Engineer approve the Contractor's request to exercise option a., b., or c., the Contractor shall be paid for the excavation or removal of such material at the applicable contract price. The Contractor shall replace, at his/her

own expense, such removed or excavated material with an agreed equal volume of material that is acceptable for use in constructing embankment, backfills, or otherwise to the extent that such replacement material is needed to complete the contract work. The Contractor shall not be charged for his/her use of such material so used in the work or removed from the site.

Should the Engineer approve the Contractor's exercise of option a., the Contractor shall be paid, at the applicable contract price, for furnishing and installing such material in accordance with requirements of the contract item in which the material is used.

It is understood and agreed that the Contractor shall make no claim for delays by reason of his/her exercise of option a., b., or c.

The Contractor shall not excavate, remove, or otherwise disturb any material, structure, or part of a structure which is located outside the lines, grades, or grading sections established for the work, except where such excavation or removal is provided for in the contract, plans, or specifications.

40-08 FINAL CLEANING UP. Upon completion of the work and before acceptance and final payment will be made, the Contractor shall remove from the site all machinery, equipment, surplus and discarded materials, rubbish, temporary structures, and stumps or portions of trees. He shall cut all brush and woods within the limits indicated and shall leave the site in a neat and presentable condition. Material cleared from the site and deposited on adjacent property will not be considered as having been disposed of satisfactorily, unless the Contractor has obtained the written permission of such property owner.

END OF SECTION 40

Section 50 Control of Work

50-01 AUTHORITY OF THE ENGINEER. The Engineer shall decide any and all questions which may arise as to the quality and acceptability of materials furnished, work performed, and as to the manner of performance and rate of progress of the work. The Engineer shall decide all questions that may arise as to the interpretation of the specifications or plans relating to the work. The Engineer shall determine the amount and quality of the several kinds of work performed and materials furnished which are to be paid for the under contract.

The Engineer does not have the authority to accept pavements that do not conform to FAA specification requirements.

50-02 CONFORMITY WITH PLANS AND SPECIFICATIONS. All work and all materials furnished shall be in reasonably close conformity with the lines, grades, grading sections, cross sections, dimensions, material requirements, and testing requirements that are specified (including specified tolerances) in the contract, plans or specifications.

If the Engineer finds the materials furnished, work performed, or the finished product not within reasonably close conformity with the plans and specifications but that the portion of the work affected will, in his/her opinion, result in a finished product having a level of safety, economy, durability, and workmanship acceptable to the Owner, he will advise the Owner of his/her determination that the affected work be accepted and remain in place. In this event, the Engineer will document his/her determination and recommend to the Owner a basis of acceptance that will provide for an adjustment in the contract price for the affected portion of the work. The Engineer's determination and recommended contract price adjustments will be based on good engineering judgment and such tests or retests of the affected work as are, in his/her opinion, needed. Changes in the contract price shall be covered by contract modifications (change order or supplemental agreement) as applicable.

If the Engineer finds the materials furnished, work performed, or the finished product are not in reasonably close conformity with the plans and specifications and have resulted in an unacceptable finished product, the affected work or materials shall be removed and replaced or otherwise corrected by and at the expense of the Contractor in accordance with the Engineer's written orders.

For the purpose of this subsection, the term "reasonably close conformity" shall not be construed as waiving the Contractor's responsibility to complete the work in accordance with the contract, plans, and specifications. The term shall not be construed as waiving the Engineer's responsibility to insist on strict compliance with the requirements of the contract, plans, and specifications during the Contractor's prosecution of the work, when, in the Engineer's opinion, such compliance is essential to provide an acceptable finished portion of the work.

For the purpose of this subsection, the term "reasonably close conformity" is also intended to provide the Engineer with the authority, after consultation with the FAA, to use good engineering judgment in his/her determinations as to acceptance of work that is not in strict conformity but will provide a finished product equal to or better than that intended by the requirements of the contract, plans and specifications.

The Engineer will not be responsible for the Contractor's means, methods, techniques, sequences, or procedures of construction or the safety precautions incident thereto.

50-03 COORDINATION OF CONTRACT, PLANS, AND SPECIFICATIONS. The contract, plans, specifications, and all referenced standards cited are essential parts of the contract requirements. A requirement occurring in one is as binding as though occurring in all. They are intended to be complementary and to describe and provide for a complete work. In case of discrepancy, calculated dimensions will govern over scaled dimensions; contract technical specifications shall govern over contract general provisions, plans, cited standards for materials or testing, and cited FAA advisory circulars; contract general provisions shall govern over plans, cited standards for materials or testing, and cited FAA advisory circulars; plans shall govern over cited standards for materials or testing and cited FAA advisory circulars. If any paragraphs contained in the Special Provisions conflict with General Provisions or Technical Specifications, the Special Provisions shall govern.

From time to time, discrepancies within cited standards for testing occur due to the timing of changing, editing, and replacing of standards. In the event the Contractor discovers any apparent discrepancy within standard test methods, he shall immediately call upon the Engineer for his/her interpretation and decision, and such decision shall be final.

The Contractor shall not take advantage of any apparent error or omission on the plans or specifications. In the event the Contractor discovers any apparent error or discrepancy, he shall immediately call upon the Engineer for his/her interpretation and decision, and such decision shall be final.

50-04 COOPERATION OF CONTRACTOR. The Contractor will be supplied with five copies each of the plans and specifications. He shall have available on the work at all times one copy each of the plans and specifications. Additional copies of plans and specifications may be obtained by the Contractor for the cost of reproduction.

The Contractor shall give constant attention to the work to facilitate the progress thereof, and he shall cooperate with the Engineer and his/her inspectors and with other contractors in every way possible. The Contractor shall have a competent superintendent on the work at all times who is fully authorized as his/her agent on the work. The superintendent shall be capable of reading and thoroughly understanding the plans and specifications and shall receive and fulfill instructions from the Engineer or his/her authorized representative.

50-05 COOPERATION BETWEEN CONTRACTORS. The Owner reserves the right to contract for and perform other or additional work on or near the work covered by this contract.

When separate contracts are let within the limits of any one project, each Contractor shall conduct his/her work so as not to interfere with or hinder the progress of completion of the work being performed by other Contractors. Contractors working on the same project shall cooperate with each other as directed.

Each Contractor involved shall assume all liability, financial or otherwise, in connection with his/her contract and shall protect and save harmless the Owner from any and all damages or claims that may arise because of inconvenience, delays, or loss experienced by him because of the presence and operations of other Contractors working within the limits of the same project.

The Contractor shall arrange his/her work and shall place and dispose of the materials being used so as not to interfere with the operations of the other Contractors within the limits of the same project. He shall join his/her work with that of the others in an acceptable manner and shall perform it in proper sequence to that of the others.

50-06 CONSTRUCTION LAYOUT AND STAKES. The Engineer shall establish horizontal and vertical control only. The Contractor must establish all layout required for the construction of the work. Such stakes and markings as the Engineer may set for either his/her own or the Contractor's guidance shall be preserved by the Contractor. In case of negligence on the part of the Contractor, or his/her employees, resulting in the destruction of such stakes or markings, an amount equal to the cost of replacing the same may be deducted from subsequent estimates due the Contractor at the discretion of the Engineer.

The Contractor will be required to furnish all lines, grades and measurements from the control points necessary for the proper prosecution and control of the work contracted for under these specifications.

The Contractor must give weekly copies of the survey notes to the Engineer so that the Engineer may check them as to accuracy and method of staking. All areas that are staked by the Contractor must be checked by the Engineer prior to beginning any work in the area. The Engineer will make periodic checks of the grades and alignment set by the Contractor. In case of error on the part of the Contractor, or his/her employees, resulting in establishing grades and/or alignment that are not in accordance with the plans or established by the Engineer, all construction not in accordance with the established grades and/or alignment shall be replaced without additional cost to the Owner.

No direct payment will be made, unless otherwise specified in contract documents, for this labor, materials, or other expenses therewith. The cost thereof shall be included in the price of the bid for the various items of the Contract.

Construction Staking and Layout includes but is not limited to:

- Clearing and Grubbing perimeter staking.

- Rough Grade slope stakes at 100-foot stations.

- Drainage Swales slope stakes and flow line blue tops at 50-foot stations.

- Subgrade blue tops at 25-foot stations and 25-foot offset distance (max.) for the following section locations:

- a. Runway – minimum 5 per station
- b. Taxiways – minimum 3 per station
- c. Holding apron areas – minimum 3 per station
- d. Roadways – minimum 3 per station

Base Course blue tops at 25 foot stations and 25-foot offset distance (max.) for the following section locations:

- a. Runway – minimum 5 per station
- b. Taxiways – minimum 3 per station
- c. Holding apron areas – minimum 3 per station

Pavement areas:

- a. Edge of Pavement hubs and tacks (for stringline by Contractor) at 100-foot stations
- b. Between Lifts at 25-foot stations for the following section locations:

- (1). Runways – each paving lane width
- (2). Taxiways – each paving lane width
- (3). Holding areas – each paving lane width

- c. After finish paving operations at 50-foot stations

- (1). All paved areas – Edge of each paving lane prior to next paving lot

- d. Shoulder and safety area blue tops at 50-foot stations and at all break points with maximum of 50 foot offsets

Fence lines at 100-foot stations

Electrical and Communications System locations, lines and grades including but not limited to duct runs, connections, fixtures, signs, lights, VASIs, PAPIs, REILs, Wind Cones, Distance Markers (signs), pull boxes and manholes.

Drain lines, cut stakes and alignment on 25-foot stations, inlet and manholes.

Painting and Striping layout (pinned with 1.5 in PK nails) marked for paint Contractor. (All nails shall be removed after painting)

Laser, or other automatic control devices, shall be checked with temporary control point or grade hub at a minimum of once per 400 feet per pass (that is, paving lane).

Note: Controls and stakes disturbed or suspect of having been disturbed shall be checked and/or reset as directed by the Engineer without additional cost to the Owner.

50-07 AUTOMATICALLY CONTROLLED EQUIPMENT. Whenever batching or mixing plant equipment is required to be operated automatically under the contract and a breakdown or malfunction of the automatic controls occurs, the equipment may be operated manually or by other methods for a period 48 hours following the breakdown or malfunction, provided this method of operations will produce results which conform to all other requirements of the contract.

50-08 AUTHORITY AND DUTIES OF INSPECTORS. Inspectors employed by the Owner shall be authorized to inspect all work done and all material furnished. Such inspection may extend to all or any part of the work and to the preparation, fabrication, or manufacture of the materials to be used. Inspectors are not authorized to revoke, alter, or waive any provision of the contract. Inspectors are not authorized to issue instructions contrary to the plans and specifications or to act as foreman for the Contractor.

Inspectors employed by the Owner are authorized to notify the Contractor or his/her representatives of any failure of the work or materials to conform to the requirements of the contract, plans, or specifications and to reject such nonconforming materials in question until such issues can be referred to the Engineer for his/her decision.

50-09 INSPECTION OF THE WORK. All materials and each part or detail of the work shall be subject to inspection by the Engineer. The Engineer shall be allowed access to all parts of the work and shall be furnished with such information and assistance by the Contractor as is required to make a complete and detailed inspection.

If the Engineer requests it, the Contractor, at any time before acceptance of the work, shall remove or uncover such portions of the finished work as may be directed. After examination, the Contractor shall restore said portions of the work to the standard required by the specifications. Should the work thus exposed or examined prove acceptable, the uncovering, or removing, and the replacing of the covering or making good of the parts removed will be paid for as extra work; but should the work so exposed or examined prove unacceptable, the uncovering, or removing, and the replacing of the covering or making good of the parts removed will be at the Contractor's expense.

Any work done or materials used without supervision or inspection by an authorized representative of the Owner may be ordered removed and replaced at the Contractor's expense unless the Owner's representative failed to inspect after having been given reasonable notice in writing that the work was to be performed.

Should the contract work include relocation, adjustment, or any other modification to existing facilities, not the property of the (contract) Owner, authorized representatives of the owners of such facilities shall have the right to inspect such work. Such inspection shall in no sense make any facility owner a party to the contract, and shall in no way interfere with the rights of the parties to this contract.

50-10 REMOVAL OF UNACCEPTABLE AND UNAUTHORIZED WORK. All work that does not conform to the requirements of the contract, plans, and specifications will be considered unacceptable, unless otherwise determined acceptable by the Engineer as provided in the subsection titled CONFORMITY WITH PLANS AND SPECIFICATIONS of this section.

Unacceptable work, whether the result of poor workmanship, use of defective materials, damage through carelessness, or any other cause found to exist prior to the final acceptance of the work, shall be removed immediately and replaced in an acceptable manner in accordance with the provisions of the subsection titled CONTRACTOR'S RESPONSIBILITY FOR WORK of Section 70.

No removal work made under provision of this subsection shall be done without lines and grades having been given by the Engineer. Work done contrary to the instructions of the Engineer, work done beyond the lines shown on the plans or as given, except as herein specified, or any extra work done without authority, will be considered as unauthorized and will not be paid for under the provisions of the contract. Work so done may be ordered removed or replaced at the Contractor's expense.

Upon failure on the part of the Contractor to comply forthwith with any order of the Engineer made under the provisions of this subsection, the Engineer will have authority to cause unacceptable work to be remedied or removed and replaced and unauthorized work to be removed and to deduct the costs (incurred by the Owner) from any monies due or to become due the Contractor.

50-11 LOAD RESTRICTIONS. The Contractor shall comply with all legal load restrictions in the hauling of materials on public roads beyond the limits of the work. A special permit will not relieve the Contractor of liability for damage that may result from the moving of material or equipment.

The operation of equipment of such weight or so loaded as to cause damage to structures or to any other type of construction will not be permitted. Hauling of materials over the base course or surface course under construction shall be limited as directed. No loads will be permitted on a concrete pavement, base, or structure before the expiration of the curing period. The Contractor shall be responsible for all damage done by his/her hauling equipment and shall correct such damage at his/her own expense.

50-12 MAINTENANCE DURING CONSTRUCTION. The Contractor shall maintain the work during construction and until the work is accepted. This maintenance shall constitute continuous and effective work prosecuted day by day, with adequate equipment and forces so that the work is maintained in satisfactory condition at all times.

In the case of a contract for the placing of a course upon a course or subgrade previously constructed, the Contractor shall maintain the previous course or subgrade during all construction operations.

All costs of maintenance work during construction and before the project is accepted shall be included in the unit prices bid on the various contract items, and the Contractor will not be paid an additional amount for such work.

50-13 FAILURE TO MAINTAIN THE WORK. Should the Contractor at any time fail to maintain the work as provided in the subsection titled MAINTENANCE DURING CONSTRUCTION of this section, the Engineer shall immediately notify the Contractor of such noncompliance. Such notification shall specify a reasonable time within which the Contractor shall be required to remedy such unsatisfactory maintenance condition. The time specified will give due consideration to the exigency that exists.

Should the Contractor fail to respond to the Engineer's notification, the Owner may suspend any work necessary for the Owner to correct such unsatisfactory maintenance condition, depending on the exigency that exists. Any maintenance cost incurred by the Owner, shall be deducted from monies due or to become due the Contractor.

50-14 PARTIAL ACCEPTANCE. If at any time during the prosecution of the project the Contractor substantially completes a usable unit or portion of the work, the occupancy of which will benefit the Owner, he may request the Engineer to make final inspection of that unit. If the Engineer finds upon inspection that the unit has been satisfactorily completed in compliance with the contract, he may accept it as being completed, and the Contractor may be relieved of further responsibility for that unit. Such partial acceptance and beneficial occupancy by the Owner shall not void or alter any provision of the contract.

50-15 FINAL ACCEPTANCE. Upon due notice from the Contractor of presumptive completion of the entire project, the Engineer and Owner will make an inspection. If all construction provided for and contemplated by the contract is found to be completed in accordance with the contract, plans, and specifications, such inspection shall constitute the final inspection. The Engineer shall notify the Contractor in writing of final acceptance as of the date of the final inspection.

If, however, the inspection discloses any work, in whole or in part, as being unsatisfactory, the Engineer will give the Contractor the necessary instructions for correction of same and the Contractor shall immediately comply with and execute such instructions. Upon correction of the work, another inspection will be made which shall constitute the final inspection, provided the work has been satisfactorily completed. In such event, the Engineer will make the final acceptance and notify the Contractor in writing of this acceptance as of the date of final inspection.

50-16 CLAIMS FOR ADJUSTMENT AND DISPUTES. If for any reason the Contractor deems that additional compensation is due him for work or materials not clearly provided for in the contract, plans, or specifications or previously authorized as extra work, he shall notify the Engineer in writing of his/her intention to claim such additional compensation before he begins the work on which he bases the claim. If such notification is not given or the Engineer is not afforded proper opportunity by the Contractor for keeping strict account of actual cost as required, then the Contractor hereby agrees to waive any claim for such additional compensation. Such notice by the Contractor and the fact that the Engineer has kept account of the cost of the work shall not in any way be construed as proving or substantiating the validity of the claim. When the work on which the claim for additional compensation is based has been completed, the Contractor shall, within 10 calendar days, submit his/her written claim to the Engineer who will present it to the Owner for consideration in accordance with local laws or ordinances.

Nothing in this subsection shall be construed as a waiver of the Contractor's right to dispute final payment based on differences in measurements or computations.

50-17 COST REDUCTION INCENTIVE. (Not used)

END OF SECTION 50

Section 60 Control of Materials

60-01 SOURCE OF SUPPLY AND QUALITY REQUIREMENTS. The materials used on the work shall conform to the requirements of the contract, plans, and specifications. Unless otherwise specified, such materials that are manufactured or processed shall be new (as compared to used or reprocessed).

In order to expedite the inspection and testing of materials, the Contractor shall furnish complete statements to the Engineer as to the origin, composition, and manufacture of all materials to be used in the work. Such statements shall be furnished promptly after execution of the contract but, in all cases, prior to delivery of such materials.

At the Engineer's option, materials may be approved at the source of supply before delivery is stated. If it is found after trial that sources of supply for previously approved materials do not produce specified products, the Contractor shall furnish materials from other sources.

60-02 SAMPLES, TESTS, AND CITED SPECIFICATIONS. Unless otherwise designated, all materials used in the work shall be inspected, tested, and approved by the Engineer before incorporation in the work. Any work in which untested materials are used without approval or written permission of the Engineer shall be performed at the Contractor's risk. Materials found to be unacceptable and unauthorized will not be paid for and, if directed by the Engineer, shall be removed at the Contractor's expense.

Unless otherwise designated, tests in accordance with the cited standard methods of ASTM, AASHTO, Federal Specifications, Commercial Item Descriptions, and all other cited methods, which are current on the date of advertisement for bids, will be made by and at the expense of the Engineer.

The testing organizations performing on site field tests shall have copies of all referenced standards on the construction site for use by all technicians and other personnel, including the Contractor's representative at his/her request. Unless otherwise designated, samples will be taken by a qualified representative of the Engineer. All materials being used are subject to inspection, test, or rejection at any time prior to or during incorporation into the work. Copies of all tests will be furnished to the Contractor's representative at his/her request.

The Contractor shall employ a testing organization to perform all Contractor required tests. The Contractor shall submit to the Engineer resumes on all testing organizations and individual persons who will be performing the tests. The Engineer will determine if such persons are qualified. All the test data shall be reported to the Engineer after the results are known. A legible, handwritten copy of all test data shall be given to the Engineer daily, along with printed reports, in an approved format, on a weekly basis. After completion of the project, and prior to final payment, the Contractor shall submit a final report to the Engineer showing all test data reports, plus an analysis of all results showing ranges, averages, and corrective action taken on all failing tests.

60-03 CERTIFICATION OF COMPLIANCE. The Engineer may permit the use, prior to sampling and testing, of certain materials or assemblies when accompanied by manufacturer's certificates of compliance stating that such materials or assemblies fully comply with the requirements of the contract. The certificate shall be signed by the manufacturer. Each lot of such materials or assemblies delivered to the work must be accompanied by a certificate of compliance in which the lot is clearly identified.

Materials or assemblies used on the basis of certificates of compliance may be sampled and tested at any time and if found not to be in conformity with contract requirements will be subject to rejection whether in place or not.

The form and distribution of certificates of compliance shall be as approved by the Engineer.

When a material or assembly is specified by "brand name or equal" and the Contractor elects to furnish the specified "brand name," the Contractor shall be required to furnish the manufacturer's certificate of compliance for each lot of such material or assembly delivered to the work. Such certificate of compliance shall clearly identify each lot delivered and shall certify as to:

- a. Conformance to the specified performance, testing, quality or dimensional requirements; and,
- b. Suitability of the material or assembly for the use intended in the contract work.

Should the Contractor propose to furnish an “or equal” material or assembly, he shall furnish the manufacturer’s certificates of compliance as hereinbefore described for the specified brand name material or assembly. However, the Engineer shall be the sole judge as to whether the proposed “or equal” is suitable for use in the work.

The Engineer reserves the right to refuse permission for use of materials or assemblies on the basis of certificates of compliance.

60-04 PLANT INSPECTION. The Engineer or his/her authorized representative may inspect, at its source, any specified material or assembly to be used in the work. Manufacturing plants may be inspected from time to time for the purpose of determining compliance with specified manufacturing methods or materials to be used in the work and to obtain samples required for his/her acceptance of the material or assembly.

Should the Engineer conduct plant inspections, the following conditions shall exist:

a. The Engineer shall have the cooperation and assistance of the Contractor and the producer with whom he has contracted for materials.

b. The Engineer shall have full entry at all reasonable times to such parts of the plant that concern the manufacture or production of the materials being furnished.

c. If required by the Engineer, the Contractor shall arrange for adequate office or working space that may be reasonably needed for conducting plant inspections. Office or working space should be conveniently located with respect to the plant.

It is understood and agreed that the Owner shall have the right to retest any material that has been tested and approved at the source of supply after it has been delivered to the site. The Engineer shall have the right to reject only material which, when retested, does not meet the requirements of the contract, plans, or specifications.

60-05 ENGINEER’S FIELD OFFICE. Not used.

60-06 STORAGE OF MATERIALS. Materials shall be so stored as to assure the preservation of their quality and fitness for the work. Stored materials, even though approved before storage, may again be inspected prior to their use in the work. Stored materials shall be located so as to facilitate their prompt inspection. The Contractor shall coordinate the storage of all materials with the Engineer. Materials to be stored on airport property shall not create an obstruction to air navigation nor shall they interfere with the free and unobstructed movement of aircraft. Unless otherwise shown on the plans, the storage of materials and the location of the Contractor’s plant and parked equipment or vehicles shall be as directed by the Engineer. Private property shall not be used for storage purposes without written permission of the owner or lessee of such property. The Contractor shall make all arrangements and bear all expenses for the storage of materials on private property. Upon request, the Contractor shall furnish the Engineer a copy of the property owner’s permission.

All storage sites on private or airport property shall be restored to their original condition by the Contractor at his/her entire expense, except as otherwise agreed to (in writing) by the owner or lessee of the property.

60-07 UNACCEPTABLE MATERIALS. Any material or assembly that does not conform to the requirements of the contract, plans, or specifications shall be considered unacceptable and shall be rejected. The Contractor shall remove any rejected material or assembly from the site of the work, unless otherwise instructed by the Engineer.

Rejected material or assembly, the defects of which have been corrected by the Contractor, shall not be returned to the site of the work until such time as the Engineer has approved its use in the work.

60-08 OWNER FURNISHED MATERIALS. The Contractor shall furnish all materials required to complete the work, except those specified herein (if any) to be furnished by the Owner. Owner-furnished materials shall be made available to the Contractor at the location specified herein.

All costs of handling, transportation from the specified location to the site of work, storage, and installing Owner-furnished materials shall be included in the unit price bid for the contract item in which such Owner-furnished material is used.

After any Owner-furnished material has been delivered to the location specified, the Contractor shall be responsible for any demurrage, damage, loss, or other deficiencies that may occur during the Contractor’s handling, storage, or use of such Owner-furnished material. The Owner will deduct from any monies due or to become due the Contractor

any cost incurred by the Owner in making good such loss due to the Contractor's handling, storage, or use of Owner-furnished materials.

END OF SECTION 60

Section 70 Legal Regulations and Responsibility to Public

70-01 LAWS TO BE OBSERVED. The Contractor shall keep fully informed of all Federal and state laws, all local laws, ordinances, and regulations and all orders and decrees of bodies or tribunals having any jurisdiction or authority, which in any manner affect those engaged or employed on the work, or which in any way affect the conduct of the work. He shall at all times observe and comply with all such laws, ordinances, regulations, orders, and decrees; and shall protect and indemnify the Owner and all his/her officers, agents, or servants against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order, or decree, whether by himself or his/her employees.

70-02 PERMITS, LICENSES, AND TAXES. The Contractor shall procure all permits and licenses, pay all charges, fees, and taxes, and give all notices necessary and incidental to the due and lawful prosecution of the work.

70-03 PATENTED DEVICES, MATERIALS, AND PROCESSES. If the Contractor is required or desires to use any design, device, material, or process covered by letters of patent or copyright, he shall provide for such use by suitable legal agreement with the patentee or owner. The Contractor and the surety shall indemnify and save harmless the Owner, any third party, or political subdivision from any and all claims for infringement by reason of the use of any such patented design, device, material or process, or any trademark or copyright, and shall indemnify the Owner for any costs, expenses, and damages which it may be obliged to pay by reason of an infringement, at any time during the prosecution or after the completion of the work.

70-04 RESTORATION OF SURFACES DISTURBED BY OTHERS. The Owner reserves the right to authorize the construction, reconstruction, or maintenance of any public or private utility service, FAA or National Oceanic and Atmospheric Administration (NOAA) facility, or a utility service of another government agency at any time during the progress of the work.

The Contractor shall not permit any individual, firm, or corporation to excavate or otherwise disturb such utility services or facilities located within the limits of the work without the written permission of the Engineer.

Should the owner of public or private utility service, FAA, or NOAA facility, or a utility service of another government agency be authorized to construct, reconstruct, or maintain such utility service or facility during the progress of the work, the Contractor shall cooperate with such owners by arranging and performing the work in this contract so as to facilitate such construction, reconstruction or maintenance by others whether or not such work by others is listed above. When ordered as extra work by the Engineer, the Contractor shall make all necessary repairs to the work which are due to such authorized work by others, unless otherwise provided for in the contract, plans, or specifications. It is understood and agreed that the Contractor shall not be entitled to make any claim for damages due to such authorized work by others or for any delay to the work resulting from such authorized work.

70-05 FEDERAL AID PARTICIPATION. For AIP contracts, the United States Government has agreed to reimburse the Owner for some portion of the contract costs. Such reimbursement is made from time to time upon the Owner's request to the FAA. In consideration of the United States Government's (FAA's) agreement with the Owner, the Owner has included provisions in this contract pursuant to the requirements of Title 49 of the United States Code (USC) and the Rules and Regulations of the FAA that pertain to the work.

As required by the USC, the contract work is subject to the inspection and approval of duly authorized representatives of the Administrator, FAA, and is further subject to those provisions of the rules and regulations that are cited in the contract, plans, or specifications.

No requirement of the USC, the rules and regulations implementing the USC, or this contract shall be construed as making the Federal Government a party to the contract nor will any such requirement interfere, in any way, with the rights of either party to the contract.

70-06 SANITARY, HEALTH, AND SAFETY PROVISIONS. The Contractor shall provide and maintain in a neat, sanitary condition such accommodations for the use of his/her employees as may be necessary to comply with the requirements of the state and local Board of Health, or of other bodies or tribunals having jurisdiction.

Attention is directed to Federal, state, and local laws, rules and regulations concerning construction safety and health standards. The Contractor shall not require any worker to work in surroundings or under conditions that are unsanitary, hazardous, or dangerous to his/her health or safety.

70-07 PUBLIC CONVENIENCE AND SAFETY. The Contractor shall control his/her operations and those of his/her subcontractors and all suppliers, to assure the least inconvenience to the traveling public. Under all circumstances, safety shall be the most important consideration.

The Contractor shall maintain the free and unobstructed movement of aircraft and vehicular traffic with respect to his/her own operations and those of his/her subcontractors and all suppliers in accordance with the subsection titled MAINTENANCE OF TRAFFIC of Section 40 hereinbefore specified and shall limit such operations for the convenience and safety of the traveling public as specified in the subsection titled LIMITATION OF OPERATIONS of Section 80 hereinafter.

70-08 BARRICADES, WARNING SIGNS, AND HAZARD MARKINGS. The Contractor shall furnish, erect, and maintain all barricades, warning signs, and markings for hazards necessary to protect the public and the work. When used during periods of darkness, such barricades, warning signs, and hazard markings shall be suitably illuminated. Unless otherwise specified, barricades, warning signs, and markings for hazards that are in the air operations area shall be a maximum of 18 in high. Unless otherwise specified, barricades shall be spaced not more than 25 feet apart. Barricades, warning signs, and markings shall be paid for under Section 40-05.

For vehicular and pedestrian traffic, the Contractor shall furnish, erect, and maintain barricades, warning signs, lights and other traffic control devices in reasonable conformity with the Manual of Uniform Traffic Control Devices for Streets and Highways (published by the United States Government Printing Office).

When the work requires closing an air operations area of the airport or portion of such area, the Contractor shall furnish, erect, and maintain temporary markings and associated lighting conforming to the requirements of AC 150/5340-1, Standards for Airport Markings.

The Contractor shall furnish, erect, and maintain markings and associated lighting of open trenches, excavations, temporary stock piles, and his/her parked construction equipment that may be hazardous to the operation of emergency fire-rescue or maintenance vehicles on the airport in reasonable conformance to AC 150/5370-2, Operational Safety on Airports During Construction.

The Contractor shall identify each motorized vehicle or piece of construction equipment in reasonable conformance to AC 150/5370-2.

The Contractor shall furnish and erect all barricades, warning signs, and markings for hazards prior to commencing work that requires such erection and shall maintain the barricades, warning signs, and markings for hazards until their dismantling is directed by the Engineer.

Open-flame type lights shall not be permitted within the air operations areas of the airport.

70-09 USE OF EXPLOSIVES. When the use of explosives is necessary for the prosecution of the work, the Contractor shall exercise the utmost care not to endanger life or property, including new work. The Contractor shall be responsible for all damage resulting from the use of explosives.

All explosives shall be stored in a secure manner in compliance with all laws and ordinances, and all such storage places shall be clearly marked. Where no local laws or ordinances apply, storage shall be provided satisfactory to the Engineer and, in general, not closer than 1,000 feet (300 m) from the work or from any building, road, or other place of human occupancy.

The Contractor shall notify each property owner and public utility company having structures or facilities in proximity to the site of the work of his/her intention to use explosives. Such notice shall be given sufficiently in advance to enable them to take such steps as they may deem necessary to protect their property from injury.

The use of electrical blasting caps shall not be permitted on or within 1,000 feet (300 m) of the airport property.

70-10 PROTECTION AND RESTORATION OF PROPERTY AND LANDSCAPE. The Contractor shall be responsible for the preservation of all public and private property, and shall protect carefully from disturbance or damage all land monuments and property markers until the Engineer has witnessed or otherwise referenced their location and shall not move them until directed.

The Contractor shall be responsible for all damage or injury to property of any character, during the prosecution of the work, resulting from any act, omission, neglect, or misconduct in his/her manner or method of executing the work, or at any time due to defective work or materials, and said responsibility will not be released until the project shall have been completed and accepted.

When or where any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work, or in consequence of the non-execution thereof by the Contractor, he shall restore, at his/her own expense, such property to a condition similar or equal to that existing before such damage or injury was done, by repairing, or otherwise restoring as may be directed, or he shall make good such damage or injury in an acceptable manner.

70-11 RESPONSIBILITY FOR DAMAGE CLAIMS. The Contractor shall indemnify and save harmless the Engineer and the Owner and their officers, and employees from all suits actions, or claims of any character brought because of any injuries or damage received or sustained by any person, persons, or property on account of the operations of the Contractor; or on account of or in consequence of any neglect in safeguarding the work; or through use of unacceptable materials in constructing the work; or because of any act or omission, neglect, or misconduct of said Contractor; or because of any claims or amounts recovered from any infringements of patent, trademark, or copyright; or from any claims or amounts arising or recovered under the "Workmen's Compensation Act," or any other law, ordinance, order, or decree. Money due the Contractor under and by virtue of his/her contract as may be considered necessary by the Owner for such purpose may be retained for the use of the Owner or, in case no money is due, his/her surety may be held until such suits, actions, or claims for injuries or damages as aforesaid shall have been settled and suitable evidence to that effect furnished to the Owner, except that money due the Contractor will not be withheld when the Contractor produces satisfactory evidence that he is adequately protected by public liability and property damage insurance.

70-12 THIRD PARTY BENEFICIARY CLAUSE. It is specifically agreed between the parties executing the contract that it is not intended by any of the provisions of any part of the contract to create the public or any member thereof a third party beneficiary or to authorize anyone not a party to the contract to maintain a suit for personal injuries or property damage pursuant to the terms or provisions of the contract.

70-13 OPENING SECTIONS OF THE WORK TO TRAFFIC. Should it be necessary for the Contractor to complete portions of the contract work for the beneficial occupancy of the Owner prior to completion of the entire contract, such "phasing" of the work shall be specified herein and indicated on the plans. When so specified, the Contractor shall complete such portions of the work on or before the date specified or as otherwise specified. The Contractor shall make his/her own estimate of the difficulties involved in arranging his/her work to permit such beneficial occupancy by the Owner as described below:

Phase or Description

Required Date or Sequence of Owner's Beneficial Occupancy

Work Shown on Plan Sheet

Upon completion of any portion of the work listed above, such portion shall be accepted by the Owner in accordance with the subsection titled PARTIAL ACCEPTANCE of Section 50.

No portion of the work may be opened by the Contractor for public use until ordered by the Engineer in writing. Should it become necessary to open a portion of the work to public traffic on a temporary or intermittent basis, such openings shall be made when, in the opinion of the Engineer, such portion of the work is in an acceptable condition to support the intended traffic. Temporary or intermittent openings are considered to be inherent in the work and shall not constitute either acceptance of the portion of the work so opened or a waiver of any provision of the contract. Any damage to the portion of the work so opened that is not attributable to traffic which is permitted by the Owner shall be repaired by the Contractor at his/her expense.

The Contractor shall make his/her own estimate of the inherent difficulties involved in completing the work under the conditions herein described and shall not claim any added compensation by reason of delay or increased cost due to opening a portion of the contract work.

Contractor shall be required to conform to safety standards contained AC 150/5370-2, Operational Safety on Airports During Construction (See Special Provisions.)

Contractor shall refer to the approved safety plan to identify barricade requirements and other safety requirements prior to opening up sections of work to traffic.

70-14 CONTRACTOR'S RESPONSIBILITY FOR WORK. Until the Engineer's final written acceptance of the entire completed work, excepting only those portions of the work accepted in accordance with the subsection titled PARTIAL ACCEPTANCE of Section 50, the Contractor shall have the charge and care thereof and shall take every precaution against injury or damage to any part due to the action of the elements or from any other cause, whether arising from the execution or from the non-execution of the work. The Contractor shall rebuild, repair, restore, and make good all injuries or damages to any portion of the work occasioned by any of the above causes before final acceptance and shall bear the expense thereof except damage to the work due to unforeseeable causes beyond the control of and without the fault or negligence of the Contractor, including but not restricted to acts of God such as earthquake, tidal wave, tornado, hurricane or other cataclysmic phenomenon of nature, or acts of the public enemy or of government authorities.

If the work is suspended for any cause whatever, the Contractor shall be responsible for the work and shall take such precautions necessary to prevent damage to the work. The Contractor shall provide for normal drainage and shall erect necessary temporary structures, signs, or other facilities at his/her expense. During such period of suspension of work, the Contractor shall properly and continuously maintain in an acceptable growing condition all living material in newly established planting, seedings, and soddings furnished under his/her contract, and shall take adequate precautions to protect new tree growth and other important vegetative growth against injury.

70-15 CONTRACTOR'S RESPONSIBILITY FOR UTILITY SERVICE AND FACILITIES OF OTHERS.

As provided in the subsection titled RESTORATION OF SURFACES DISTURBED BY OTHERS of this section, the Contractor shall cooperate with the owner of any public or private utility service, FAA or NOAA, or a utility service of another government agency that may be authorized by the owner to construct, reconstruct or maintain such utility services or facilities during the progress of the work. In addition, the Contractor shall control his/her operations to prevent the unscheduled interruption of such utility services and facilities.

To the extent that such public or private utility services, FAA, or NOAA facilities, or utility services of another governmental agency are known to exist within the limits of the contract work, the approximate locations have been indicated on the plans.

It is understood and agreed that the Owner does not guarantee the accuracy or the completeness of the location information relating to existing utility services, facilities, or structures that may be shown on the plans or encountered in the work. Any inaccuracy or omission in such information shall not relieve the Contractor of his/her responsibility to protect such existing features from damage or unscheduled interruption of service.

It is further understood and agreed that the Contractor shall, upon execution of the contract, notify the owners of all utility services or other facilities of his/her plan of operations. Such notification shall be in writing addressed to THE PERSON TO CONTACT as provided hereinbefore in this subsection and the subsection titled RESTORATION OF SURFACES DISTURBED BY OTHERS of this section. A copy of each notification shall be given to the Engineer.

In addition to the general written notification hereinbefore provided, it shall be the responsibility of the Contractor to keep such individual owners advised of changes in his/her plan of operations that would affect such owners.

Prior to commencing the work in the general vicinity of an existing utility service or facility, the Contractor shall again notify each such owner of his/her plan of operation. If, in the Contractor's opinion, the owner's assistance is needed to locate the utility service or facility or the presence of a representative of the owner is desirable to observe the work, such advice should be included in the notification. Such notification shall be given by the most expeditious means to reach the utility owner's PERSON TO CONTACT no later than two normal business days prior to the Contractor's commencement of operations in such general vicinity. The Contractor shall furnish a written summary of the notification to the Engineer.

The Contractor's failure to give the two day's notice hereinabove provided shall be cause for the Owner to suspend the Contractor's operations in the general vicinity of a utility service or facility.

Where the outside limits of an underground utility service have been located and staked on the ground, the Contractor shall be required to use excavation methods acceptable to the Engineer within 3 feet (90 cm) of such outside limits at such points as may be required to ensure protection from damage due to the Contractor's operations.

Should the Contractor damage or interrupt the operation of a utility service or facility by accident or otherwise, he shall immediately notify the proper authority and the Engineer and shall take all reasonable measures to prevent further damage or interruption of service. The Contractor, in such events, shall cooperate with the utility service or facility owner and the Engineer continuously until such damage has been repaired and service restored to the satisfaction of the utility or facility owner.

The Contractor shall bear all costs of damage and restoration of service to any utility service or facility due to his/her operations whether or not due to negligence or accident. The Owner reserves the right to deduct such costs from any monies due or which may become due the Contractor, or his/her surety.

70-15.1 FAA FACILITIES AND CABLE RUNS. Not used.

70-16 FURNISHING RIGHTS-OF-WAY. The Owner will be responsible for furnishing all rights-of-way upon which the work is to be constructed in advance of the Contractor's operations.

70-17 PERSONAL LIABILITY OF PUBLIC OFFICIALS. In carrying out any of the contract provisions or in exercising any power or authority granted to him by this contract, there shall be no liability upon the Engineer, his/her authorized representatives, or any officials of the Owner either personally or as an official of the Owner. It is understood that in such matters they act solely as agents and representatives of the Owner.

70-18 NO WAIVER OF LEGAL RIGHTS. Upon completion of the work, the Owner will expeditiously make final inspection and notify the Contractor of final acceptance. Such final acceptance, however, shall not preclude or stop the Owner from correcting any measurement, estimate, or certificate made before or after completion of the work, nor shall the Owner be precluded or stopped from recovering from the Contractor or his/her surety, or both, such overpayment as may be sustained, or by failure on the part of the Contractor to fulfill his/her obligations under the contract. A waiver on the part of the Owner of any breach of any part of the contract shall not be held to be a waiver of any other or subsequent breach.

The Contractor, without prejudice to the terms of the contract, shall be liable to the Owner for latent defects, fraud, or such gross mistakes as may amount to fraud, or as regards the owner's rights under any warranty or guaranty.

70-19 ENVIRONMENTAL PROTECTION. The Contractor shall comply with all Federal, state, and local laws and regulations controlling pollution of the environment. He shall take necessary precautions to prevent pollution of streams, lakes, ponds, and reservoirs with fuels, oils, bitumens, chemicals, or other harmful materials and to prevent pollution of the atmosphere from particulate and gaseous matter.

70-20 ARCHAEOLOGICAL AND HISTORICAL FINDINGS. Unless otherwise specified in this subsection, the Contractor is advised that the site of the work is not within any property, district, or site, and does not contain any building, structure, or object listed in the current National Register of Historic Places published by the United States Department of Interior.

Should the Contractor encounter, during his/her operations, any building, part of a building, structure, or object that is incongruous with its surroundings, he shall immediately cease operations in that location and notify the Engineer. The Engineer will immediately investigate the Contractor's finding and the Owner will direct the Contractor to either resume his/her operations or to suspend operations as directed.

Should the Owner order suspension of the Contractor's operations in order to protect an archaeological or historical finding, or order the Contractor to perform extra work, such shall be covered by an appropriate contract modification (change order or supplemental agreement) as provided in the subsection titled EXTRA WORK of Section 40 and the subsection titled PAYMENT FOR EXTRA WORK AND FORCE ACCOUNT WORK of Section 90. If appropriate, the contract modification shall include an extension of contract time in accordance with the subsection titled DETERMINATION AND EXTENSION OF CONTRACT TIME of Section 80.

END OF SECTION 70

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Section 80 Prosecution and Progress

80-01 SUBLETTING OF CONTRACT. The Owner will not recognize any subcontractor on the work. The Contractor shall at all times when work is in progress be represented either in person, by a qualified superintendent, or by other designated, qualified representative who is duly authorized to receive and execute orders of the Engineer.

Should the Contractor elect to assign his/her contract, said assignment shall be concurred in by the surety, shall be presented for the consideration and approval of the Owner, and shall be consummated only on the written approval of the Owner. In case of approval, the Contractor shall file copies of all subcontracts with the Engineer.

The Contractor shall perform, with his organization, an amount of work equal to at least 25 percent of the total contract cost.

80-02 NOTICE TO PROCEED. The notice to proceed shall state the date on which it is expected the Contractor will begin the construction and from which date contract time will be charged. The Contractor shall begin the work to be performed under the contract within 10 days of the date set by the Engineer in the written notice to proceed, but in any event, the Contractor shall notify the Engineer at least 24 hours in advance of the time actual construction operations will begin.

80-03 PROSECUTION AND PROGRESS. Unless otherwise specified, the Contractor shall submit his/her progress schedule for the Engineer's approval within 10 days after the effective date of the notice to proceed. The Contractor's progress schedule, when approved by the Engineer, may be used to establish major construction operations and to check on the progress of the work. The Contractor shall provide sufficient materials, equipment, and labor to guarantee the completion of the project in accordance with the plans and specifications within the time set forth in the proposal.

If the Contractor falls significantly behind the submitted schedule, the Contractor shall, upon the Engineer's request, submit a revised schedule for completion of the work within the contract time and modify his/her operations to provide such additional materials, equipment, and labor necessary to meet the revised schedule. Should the prosecution of the work be discontinued for any reason, the Contractor shall notify the Engineer at least 24 hours in advance of resuming operations.

For AIP contracts, the Contractor shall not commence any actual construction prior to the date on which the notice to proceed is issued by the Owner.

80-04 LIMITATION OF OPERATIONS. The Contractor shall control his/her operations and the operations of his/her subcontractors and all suppliers so as to provide for the free and unobstructed movement of aircraft in the AIR OPERATIONS AREAS (AOA) of the airport.

When the work requires the Contractor to conduct his/her operations within an AOA of the airport, the work shall be coordinated with airport operations (through the Engineer) at least 48 hours prior to commencement of such work. The Contractor shall not close an AOA until so authorized by the Engineer and until the necessary temporary marking and associated lighting is in place as provided in the subsection titled BARRICADES, WARNING SIGNS, AND HAZARD MARKINGS of Section 70.

When the contract work requires the Contractor to work within an AOA of the airport on an intermittent basis (intermittent opening and closing of the AOA), the Contractor shall maintain constant communications as hereinafter specified; immediately obey all instructions to vacate the AOA; immediately obey all instructions to resume work in such AOA. Failure to maintain the specified communications or to obey instructions shall be cause for suspension of the Contractor's operations in the AOA until the satisfactory conditions are provided. The following AOA cannot be closed to operating aircraft to permit the Contractor's operations on a continuous basis and will therefore be closed to aircraft operations intermittently as follows:

AOA

Time periods AOA can be closed

Type of communications required when working in an AOA

Control authority

Contractor shall be required to conform to safety standards contained in AC 150/5370-2, Operational Safety on Airports During Construction.

80-04.1 OPERATIONAL SAFETY ON AIRPORT DURING CONSTRUCTION. All Contractors' operations shall be conducted in accordance with the project safety plan and the provisions set forth within the current version of Advisory Circular 150/5370-2. The safety plan included within the contract documents conveys minimum requirements for operational safety on the airport during construction activities. The Contractor shall prepare and submit a plan that details how it proposes to comply with the requirements presented within the safety plan.

The Contractor shall implement all necessary safety plan measures prior to commencement of any work activity. The Contractor shall conduct routine checks of the safety plan measures to assure compliance with the safety plan measures.

The Contractor is responsible to the Owner for the conduct of all subcontractors it employs on the project. The Contractor shall assure that all subcontractors are made aware of the requirements of the safety plan and that they implement and maintain all necessary measures.

No deviation or modifications may be made to the approved safety plan unless approved in writing by the Owner or Engineer.

80-05 CHARACTER OF WORKERS, METHODS, AND EQUIPMENT. The Contractor shall, at all times, employ sufficient labor and equipment for prosecuting the work to full completion in the manner and time required by the contract, plans, and specifications.

All workers shall have sufficient skill and experience to perform properly the work assigned to them. Workers engaged in special work or skilled work shall have sufficient experience in such work and in the operation of the equipment required to perform the work satisfactorily.

Any person employed by the Contractor or by any subcontractor who violates any operational regulations and, in the opinion of the Engineer, does not perform his work in a proper and skillful manner or is intemperate or disorderly shall, at the written request of the Engineer, be removed forthwith by the Contractor or subcontractor employing such person, and shall not be employed again in any portion of the work without approval of the Engineer.

Should the Contractor fail to remove such persons or person, or fail to furnish suitable and sufficient personnel for the proper prosecution of the work, the Engineer may suspend the work by written notice until compliance with such orders.

All equipment that is proposed to be used on the work shall be of sufficient size and in such mechanical condition as to meet requirements of the work and to produce a satisfactory quality of work. Equipment used on any portion of the work shall be such that no injury to previously completed work, adjacent property, or existing airport facilities will result from its use.

When the methods and equipment to be used by the Contractor in accomplishing the work are not prescribed in the contract, the Contractor is free to use any methods or equipment that will accomplish the work in conformity with the requirements of the contract, plans, and specifications.

When the contract specifies the use of certain methods and equipment, such methods and equipment shall be used unless others are authorized by the Engineer. If the Contractor desires to use a method or type of equipment other than specified in the contract, he may request authority from the Engineer to do so. The request shall be in writing and shall include a full description of the methods and equipment proposed and of the reasons for desiring to make the change. If approval is given, it will be on the condition that the Contractor will be fully responsible for producing work in conformity with contract requirements. If, after trial use of the substituted methods or equipment, the Engineer determines that the work produced does not meet contract requirements, the Contractor shall discontinue the use of the substitute method or equipment and shall complete the remaining work with the specified methods and equipment. The Contractor shall remove any deficient work and replace it with work of specified quality, or take such other corrective action as the Engineer may direct. No change will be made in basis of payment for the contract items involved nor in contract time as a result of authorizing a change in methods or equipment under this subsection.

80-06 TEMPORARY SUSPENSION OF THE WORK. The Owner shall have the authority to suspend the work wholly, or in part, for such period or periods as he may deem necessary, due to unsuitable weather, or such other conditions as are considered unfavorable for the prosecution of the work, or for such time as is necessary due to the failure on the part of the Contractor to carry out orders given or perform any or all provisions of the contract.

In the event that the Contractor is ordered by the Owner, in writing, to suspend work for some unforeseen cause not otherwise provided for in the contract and over which the Contractor has no control, the Contractor may be reimbursed for actual money expended on the work during the period of shutdown. No allowance will be made for anticipated profits. The period of shutdown shall be computed from the effective date of the Engineer's order to suspend work to the effective date of the Engineer's order to resume the work. Claims for such compensation shall be filed with the Engineer within the time period stated in the Engineer's order to resume work. The Contractor shall submit with his/her claim information substantiating the amount shown on the claim. The Engineer will forward the Contractor's claim to the Owner for consideration in accordance with local laws or ordinances. No provision of this article shall be construed as entitling the Contractor to compensation for delays due to inclement weather, for suspensions made at the request of the Owner, or for any other delay provided for in the contract, plans, or specifications.

If it should become necessary to suspend work for an indefinite period, the Contractor shall store all materials in such manner that they will not become an obstruction nor become damaged in any way. He shall take every precaution to prevent damage or deterioration of the work performed and provide for normal drainage of the work. The Contractor shall erect temporary structures where necessary to provide for traffic on, to, or from the airport.

80-07 DETERMINATION AND EXTENSION OF CONTRACT TIME. The number of calendar or working days allowed for completion of the work shall be stated in the proposal and contract and shall be known as the CONTRACT TIME.

Should the contract time require extension for reasons beyond the Contractor's control, it shall be adjusted as follows:

a. CONTRACT TIME based on WORKING DAYS shall be calculated weekly by the Engineer. The Engineer will furnish the Contractor a copy of his/her weekly statement of the number of working days charged against the contract time during the week and the number of working days currently specified for completion of the contract (the original contract time plus the number of working days, if any, that have been included in approved CHANGE ORDERS or SUPPLEMENTAL AGREEMENTS covering EXTRA WORK).

The Engineer shall base his/her weekly statement of contract time charged on the following considerations:

(1) No time shall be charged for days on which the Contractor is unable to proceed with the principal item of work under construction at the time for at least 6 hours with the normal work force employed on such principal item. Should the normal work force be on a double-shift, 12 hours shall be used. Should the normal work force be on a triple-shift, 18 hours shall apply. Conditions beyond the Contractor's control such as strikes, lockouts, unusual delays in transportation, temporary suspension of the principal item of work under construction or temporary suspension of the entire work which have been ordered by the Owner for reasons not the fault of the Contractor, shall not be charged against the contract time.

(2) The Engineer will not make charges against the contract time prior to the effective date of the notice to proceed.

(3) The Engineer will begin charges against the contract time on the first working day after the effective date of the notice to proceed.

(4) The Engineer will not make charges against the contract time after the date of final acceptance as defined in the subsection titled FINAL ACCEPTANCE of Section 50.

(5) The Contractor will be allowed 1 week in which to file a written protest setting forth his/her objections to the Engineer's weekly statement. If no objection is filed within such specified time, the weekly statement shall be considered as acceptable to the Contractor.

The contract time (stated in the proposal) is based on the originally estimated quantities as described in the subsection titled INTERPRETATION OF ESTIMATED PROPOSAL QUANTITIES of Section 20. Should the satisfactory completion of the contract require performance of work in greater quantities than those estimated in the proposal, the contract time shall be increased in the same proportion as the cost of the actually completed quantities bears to the cost of the originally estimated quantities in the proposal. Such increase in contract time shall not

consider either the cost of work or the extension of contract time that has been covered by change order or supplemental agreement and shall be made at the time of final payment.

b. CONTRACT TIME based on CALENDAR DAYS shall consist of the number of calendar days stated in the contract counting from the effective date of the notice to proceed and including all Saturdays, Sundays, holidays, and nonwork days. All calendar days elapsing between the effective dates of the Owner's orders to suspend and resume all work, due to causes not the fault of the Contractor, shall be excluded.

At the time of final payment, the contract time shall be increased in the same proportion as the cost of the actually completed quantities bears to the cost of the originally estimated quantities in the proposal. Such increase in the contract time shall not consider either cost of work or the extension of contract time that has been covered by a change order or supplemental agreement. Charges against the contract time will cease as of the date of final acceptance.

c. When the contract time is a specified completion date, it shall be the date on which all contract work shall be substantially completed.

If the Contractor finds it impossible for reasons beyond his/her control to complete the work within the contract time as specified, or as extended in accordance with the provisions of this subsection, he may, at any time prior to the expiration of the contract time as extended, make a written request to the Engineer for an extension of time setting forth the reasons which he believes will justify the granting of his/her request. Requests for extension of time on calendar day projects, caused by inclement weather, shall be supported with National Weather Bureau data showing the actual amount of inclement weather exceeded which could normally be expected during the contract period. The Contractor's plea that insufficient time was specified is not a valid reason for extension of time. If the Engineer finds that the work was delayed because of conditions beyond the control and without the fault of the Contractor, he may extend the time for completion in such amount as the conditions justify. The extended time for completion shall then be in full force and effect, the same as though it were the original time for completion.

80-08 FAILURE TO COMPLETE ON TIME. For each calendar day or working day, as specified in the contract, that any work remains uncompleted after the contract time (including all extensions and adjustments as provided in the subsection titled DETERMINATION AND EXTENSION OF CONTRACT TIME of this Section) the sum specified in the contract and proposal as liquidated damages will be deducted from any money due or to become due the Contractor or his/her surety. Such deducted sums shall not be deducted as a penalty but shall be considered as liquidation of a reasonable portion of damages including but not limited to additional engineering services that will be incurred by the Owner should the Contractor fail to complete the work in the time provided in his/her contract.

Permitting the Contractor to continue and finish the work or any part of it after the time fixed for its completion, or after the date to which the time for completion may have been extended, will in no way operate as a waiver on the part of the Owner of any of its rights under the contract.

80-09 DEFAULT AND TERMINATION OF CONTRACT. The Contractor shall be considered in default of his/her contract and such default will be considered as cause for the Owner to terminate the contract for any of the following reasons if the Contractor:

- a.** Fails to begin the work under the contract within the time specified in the "Notice to Proceed," or
- b.** Fails to perform the work or fails to provide sufficient workers, equipment or materials to assure completion of work in accordance with the terms of the contract, or
- c.** Performs the work unsuitably or neglects or refuses to remove materials or to perform anew such work as may be rejected as unacceptable and unsuitable, or
- d.** Discontinues the prosecution of the work, or
- e.** Fails to resume work which has been discontinued within a reasonable time after notice to do so, or
- f.** Becomes insolvent or is declared bankrupt, or commits any act of bankruptcy or insolvency, or
- g.** Allows any final judgment to stand against him unsatisfied for a period of 10 days, or
- h.** Makes an assignment for the benefit of creditors, or
- i.** For any other cause whatsoever, fails to carry on the work in an acceptable manner.

Should the Engineer consider the Contractor in default of the contract for any reason hereinbefore, he shall immediately give written notice to the Contractor and the Contractor's surety as to the reasons for considering the Contractor in default and the Owner's intentions to terminate the contract.

If the Contractor or surety, within a period of 10 days after such notice, does not proceed in accordance therewith, then the Owner will, upon written notification from the Engineer of the facts of such delay, neglect, or default and the Contractor's failure to comply with such notice, have full power and authority without violating the contract, to take the prosecution of the work out of the hands of the Contractor. The Owner may appropriate or use any or all materials and equipment that have been mobilized for use in the work and are acceptable and may enter into an agreement for the completion of said contract according to the terms and provisions thereof, or use such other methods as in the opinion of the Engineer will be required for the completion of said contract in an acceptable manner.

All costs and charges incurred by the Owner, together with the cost of completing the work under contract, will be deducted from any monies due or which may become due the Contractor. If such expense exceeds the sum which would have been payable under the contract, then the Contractor and the surety shall be liable and shall pay to the Owner the amount of such excess.

80-10 TERMINATION FOR NATIONAL EMERGENCIES. The Owner shall terminate the contract or portion thereof by written notice when the Contractor is prevented from proceeding with the construction contract as a direct result of an Executive Order of the President with respect to the prosecution of war or in the interest of national defense.

When the contract, or any portion thereof, is terminated before completion of all items of work in the contract, payment will be made for the actual number of units or items of work completed at the contract price or as mutually agreed for items of work partially completed or not started. No claims or loss of anticipated profits shall be considered.

Reimbursement for organization of the work, and other overhead expenses, (when not otherwise included in the contract) and moving equipment and materials to and from the job will be considered, the intent being that an equitable settlement will be made with the Contractor.

Acceptable materials, obtained or ordered by the Contractor for the work and that are not incorporated in the work shall, at the option of the Contractor, be purchased from the Contractor at actual cost as shown by receipted bills and actual cost records at such points of delivery as may be designated by the Engineer.

Termination of the contract or a portion thereof shall neither relieve the Contractor of his/her responsibilities for the completed work nor shall it relieve his/her surety of its obligation for and concerning any just claim arising out of the work performed.

80-11 WORK AREA, STORAGE AREA AND SEQUENCE OF OPERATIONS. The Contractor shall obtain approval from the Engineer prior to beginning any work in all areas of the airport. No operating runway, taxiway, or Air Operations Area (AOA) shall be crossed, entered, or obstructed while it is operational. The Contractor shall plan and coordinate his/her work in such a manner as to insure safety and a minimum of hindrance to flight operations. All Contractor equipment and material stockpiles shall be stored a minimum of 400 feet from the centerline of an active runway. No equipment will be allowed to park within the approach area of an active runway at any time. No equipment shall be within 250 feet of an active runway at any time.

END OF SECTION 80

Section 90 Measurement and Payment

90-01 MEASUREMENT OF QUANTITIES. All work completed under the contract will be measured by the Engineer, or his/her authorized representatives, using United States Customary Units of Measurement or the International System of Units.

The method of measurement and computations to be used in determination of quantities of material furnished and of work performed under the contract will be those methods generally recognized as conforming to good engineering practice.

Unless otherwise specified, longitudinal measurements for area computations will be made horizontally, and no deductions will be made for individual fixtures (or leave-outs) having an area of 9 sq ft (0.8 square meter) or less. Unless otherwise specified, transverse measurements for area computations will be the neat dimensions shown on the plans or ordered in writing by the Engineer.

Structures will be measured according to neat lines shown on the plans or as altered to fit field conditions.

Unless otherwise specified, all contract items which are measured by the linear foot such as electrical ducts, conduits, pipe culverts, underdrains, and similar items shall be measured parallel to the base or foundation upon which such items are placed.

In computing volumes of excavation the average end area method or other acceptable methods will be used.

The thickness of plates and galvanized sheet used in the manufacture of corrugated metal pipe, metal plate pipe culverts and arches, and metal cribbing will be specified and measured in decimal fraction of in.

The term “ton” will mean the short ton consisting of 2,000 lb (907 kg) avoirdupois. All materials that are measured or proportioned by weights shall be weighed on accurate, approved scales by competent, qualified personnel at locations designed by the Engineer. If material is shipped by rail, the car weight may be accepted provided that only the actual weight of material is paid for. However, car weights will not be acceptable for material to be passed through mixing plants. Trucks used to haul material being paid for by weight shall be weighed empty daily at such times as the Engineer directs, and each truck shall bear a plainly legible identification mark.

Materials to be measured by volume in the hauling vehicle shall be hauled in approved vehicles and measured therein at the point of delivery. Vehicles for this purpose may be of any size or type acceptable to the Engineer, provided that the body is of such shape that the actual contents may be readily and accurately determined. All vehicles shall be loaded to at least their water level capacity, and all loads shall be leveled when the vehicles arrive at the point of delivery.

When requested by the Contractor and approved by the Engineer in writing, material specified to be measured by the cubic yard (cubic meter) may be weighed, and such weights will be converted to cubic yards (cubic meters) for payment purposes. Factors for conversion from weight measurement to volume measurement will be determined by the Engineer and shall be agreed to by the Contractor before such method of measurement of pay quantities is used.

Bituminous materials will be measured by the gallon (liter) or ton (kg). When measured by volume, such volumes will be measured at 60 °F (15 °C) or will be corrected to the volume at 60 °F (15 °C) using ASTM D 1250 for asphalts or ASTM D 633 for tars.

Net certified scale weights or weights based on certified volumes in the case of rail shipments will be used as a basis of measurement, subject to correction when bituminous material has been lost from the car or the distributor, wasted, or otherwise not incorporated in the work.

When bituminous materials are shipped by truck or transport, net certified weights by volume, subject to correction for loss or foaming, may be used for computing quantities.

Cement will be measured by the ton (kg) or hundredweight (kg).

Timber will be measured by the thousand feet board measure (MFBM) actually incorporated in the structure. Measurement will be based on nominal widths and thicknesses and the extreme length of each piece.

The term “lump sum” when used as an item of payment will mean complete payment for the work described in the contract.

When a complete structure or structural unit (in effect, “lump sum” work) is specified as the unit of measurement, the unit will be construed to include all necessary fittings and accessories.

Rental of equipment will be measured by time in hours of actual working time and necessary traveling time of the equipment within the limits of the work. Special equipment ordered by the Engineer in connection with force account work will be measured as agreed in the change order or supplemental agreement authorizing such force account work as provided in the subsection titled PAYMENT FOR EXTRA AND FORCE ACCOUNT WORK of this section.

When standard manufactured items are specified such as fence, wire, plates, rolled shapes, pipe conduit, etc., and these items are identified by gauge, unit weight, section dimensions, etc., such identification will be considered to be nominal weights or dimensions. Unless more stringently controlled by tolerances in cited specifications, manufacturing tolerances established by the industries involved will be accepted.

Scales for weighing materials which are required to be proportioned or measured and paid for by weight shall be furnished, erected, and maintained by the Contractor, or be certified permanently installed commercial scales.

Scales shall be accurate within one-half percent of the correct weight throughout the range of use. The Contractor shall have the scales checked under the observation of the inspector before beginning work and at such other times as requested. The intervals shall be uniform in spacing throughout the graduated or marked length of the beam or dial and shall not exceed one-tenth of 1 percent of the nominal rated capacity of the scale, but not less than 1 pound (454 grams). The use of spring balances will not be permitted.

Beams, dials, platforms, and other scale equipment shall be so arranged that the operator and the inspector can safely and conveniently view them.

Scale installations shall have available ten standard 50-pound (2.3 km) weights for testing the weighing equipment or suitable weights and devices for other approved equipment.

Scales must be tested for accuracy and serviced before use at a new site. Platform scales shall be installed and maintained with the platform level and rigid bulkheads at each end.

Scales “overweighing” (indicating more than correct weight) will not be permitted to operate, and all materials received subsequent to the last previous correct weighting-accuracy test will be reduced by the percentage of error in excess of one-half of 1 percent.

In the event inspection reveals the scales have been underweighing (indicating less than correct weight), they shall be adjusted, and no additional payment to the Contractor will be allowed for materials previously weighed and recorded.

All costs in connection with furnishing, installing, certifying, testing, and maintaining scales; for furnishing check weights and scale house; and for all other items specified in this subsection, for the weighing of materials for proportioning or payment, shall be included in the unit contract prices for the various items of the project.

When the estimated quantities for a specific portion of the work are designated as the pay quantities in the contract, they shall be the final quantities for which payment for such specific portion of the work will be made, unless the dimensions of said portions of the work shown on the plans are revised by the Engineer. If revised dimensions result in an increase or decrease in the quantities of such work, the final quantities for payment will be revised in the amount represented by the authorized changes in the dimensions.

90-02 SCOPE OF PAYMENT. The Contractor shall receive and accept compensation provided for in the contract as full payment for furnishing all materials, for performing all work under the contract in a complete and acceptable manner, and for all risk, loss, damage, or expense of whatever character arising out of the nature of the work or the prosecution thereof, subject to the provisions of the subsection titled NO WAIVER OF LEGAL RIGHTS of Section 70.

When the “basis of payment” subsection of a technical specification requires that the contract price (price bid) include compensation for certain work or material essential to the item, this same work or material will not also be measured for payment under any other contract item which may appear elsewhere in the contract, plans, or specifications.

90-03 COMPENSATION FOR ALTERED QUANTITIES. When the accepted quantities of work vary from the quantities in the proposal, the Contractor shall accept as payment in full, so far as contract items are concerned, payment at the original contract price for the accepted quantities of work actually completed and accepted. No allowance, except as provided for in the subsection titled ALTERATION OF WORK AND QUANTITIES of Section 40 will be made for any increased expense, loss of expected reimbursement, or loss of anticipated profits suffered or claimed by the Contractor which results directly from such alterations or indirectly from his/her unbalanced allocation of overhead and profit among the contract items, or from any other cause.

90-04 PAYMENT FOR OMITTED ITEMS. As specified in the subsection titled OMITTED ITEMS of Section 40, the Engineer shall have the right to omit from the work (order nonperformance) any contract item, except major contract items, in the best interest of the Owner.

Should the Engineer omit or order nonperformance of a contract item or portion of such item from the work, the Contractor shall accept payment in full at the contract prices for any work actually completed and acceptable prior to the Engineer’s order to omit or nonperform such contract item.

Acceptable materials ordered by the Contractor or delivered on the work prior to the date of the Engineer’s order will be paid for at the actual cost to the Contractor and shall thereupon become the property of the Owner.

In addition to the reimbursement hereinbefore provided, the Contractor shall be reimbursed for all actual costs incurred for the purpose of performing the omitted contract item prior to the date of the Engineer’s order. Such additional costs incurred by the Contractor must be directly related to the deleted contract item and shall be supported by certified statements by the Contractor as to the nature the amount of such costs.

90-05 PAYMENT FOR EXTRA AND FORCE ACCOUNT WORK. Extra work, performed in accordance with the subsection titled EXTRA WORK of Section 40, will be paid for at the contract prices or agreed prices specified in the change order or supplemental agreement authorizing the extra work. When the change order or supplemental agreement authorizing the extra work requires that it be done by force account, such force account shall be measured and paid for based on expended labor, equipment, and materials plus a negotiated and agreed upon allowance for overhead and profit.

a. Miscellaneous. No additional allowance will be made for general superintendence, the use of small tools, or other costs for which no specific allowance is herein provided.

b. Comparison of Record. The Contractor and the Engineer shall compare records of the cost of force account work at the end of each day. Agreement shall be indicated by signature of the Contractor and the Engineer or their duly authorized representatives.

c. Statement. No payment will be made for work performed on a force account basis until the Contractor has furnished the Engineer with duplicate itemized statements of the cost of such force account work detailed as follows:

- (1) Name, classification, date, daily hours, total hours, rate and extension for each laborer and foreman.
- (2) Designation, dates, daily hours, total hours, rental rate, and extension for each unit of machinery and equipment.
- (3) Quantities of materials, prices, and extensions.
- (4) Transportation of materials.
- (5) Cost of property damage, liability and workman’s compensation insurance premiums, unemployment insurance contributions, and social security tax.

Statements shall be accompanied and supported by a receipted invoice for all materials used and transportation charges. However, if materials used on the force account work are not specifically purchased for such work but are taken from the Contractor’s stock, then in lieu of the invoices the Contractor shall furnish an affidavit certifying that such materials were taken from his/her stock, that the quantity claimed was actually used, and that the price and transportation claimed represent the actual cost to the Contractor.

90-06 PARTIAL PAYMENTS. Partial payments will be made to the Contractor at least once each month as the work progresses. Said payments will be based upon estimates, prepared by the Engineer, of the value of the work performed and materials complete and in place in accordance with the contract, plans, and specifications. Such partial payments may also include the delivered actual cost of those materials stockpiled and stored in accordance with the subsection titled PAYMENT FOR MATERIALS ON HAND of this section. No partial payment will be made when the amount due to the Contractor since the last estimate amounts to less than five hundred dollars.

The Contractor is required to pay all subcontractors for satisfactory performance of their contracts no later than 30 days after the Contractor has received a partial payment. The Owner must ensure prompt and full payment of retainage from the prime contractor to the subcontractor within 30 days after the subcontractor's work is satisfactorily completed. A subcontractor's work is satisfactorily completed when all the tasks called for in the subcontract have been accomplished and documented as required by the Owner. When the Owner has made an incremental acceptance of a portion of a prime contract, the work of a subcontractor covered by that acceptance is deemed to be satisfactorily completed.

From the total of the amount determined to be payable on a partial payment, 10 percent of such total amount will be deducted and retained by the Owner until the final payment is made, except as may be provided (at the Contractor's option) in the subsection titled PAYMENT OF WITHHELD FUNDS of this section. The balance of the amount payable, less all previous payments, shall be certified for payment. Should the Contractor exercise his/her option, as provided in the subsection titled PAYMENT OF WITHHELD FUNDS of this section, no such percent retainage shall be deducted.

When at least 95 percent of the work has been completed, the Engineer shall, at the Owner's discretion and with the consent of the surety, prepare estimates of both the contract value and the cost of the remaining work to be done.

The Owner may retain an amount not less than twice the contract value or estimated cost, whichever is greater, of the work remaining to be done. The remainder, less all previous payments and deductions, will then be certified for payment to the Contractor.

It is understood and agreed that the Contractor shall not be entitled to demand or receive partial payment based on quantities of work in excess of those provided in the proposal or covered by approved change orders or supplemental agreements, except when such excess quantities have been determined by the Engineer to be a part of the final quantity for the item of work in question.

No partial payment shall bind the Owner to the acceptance of any materials or work in place as to quality or quantity. All partial payments are subject to correction at the time of final payment as provided in the subsection titled ACCEPTANCE AND FINAL PAYMENT of this section.

The Contractor shall deliver to the Owner a complete release of all claims for labor and material arising out of this contract before the final payment is made. If any subcontractor or supplier fails to furnish such a release in full, the Contractor may furnish a bond or other collateral satisfactory to the Owner to indemnify the Owner against any potential lien or other such claim. The bond or collateral shall include all costs, expenses, and attorney fees the Owner may be compelled to pay in discharging any such lien or claim.

90-07 PAYMENT FOR MATERIALS ON HAND. Partial payments may be made to the extent of the delivered cost of materials to be incorporated in the work, provided that such materials meet the requirements of the contract, plans, and specifications and are delivered to acceptable sites on the airport property or at other sites in the vicinity that are acceptable to the Owner. Such delivered costs of stored or stockpiled materials may be included in the next partial payment after the following conditions are met:

- a. The material has been stored or stockpiled in a manner acceptable to the Engineer at or on an approved site.
- b. The Contractor has furnished the Engineer with acceptable evidence of the quantity and quality of such stored or stockpiled materials.
- c. The Contractor has furnished the Engineer with satisfactory evidence that the material and transportation costs have been paid.
- d. The Contractor has furnished the Owner legal title (free of liens or encumbrances of any kind) to the material so stored or stockpiled.

e. The Contractor has furnished the Owner evidence that the material so stored or stockpiled is insured against loss by damage to or disappearance of such materials at any time prior to use in the work.

It is understood and agreed that the transfer of title and the Owner's payment for such stored or stockpiled materials shall in no way relieve the Contractor of his/her responsibility for furnishing and placing such materials in accordance with the requirements of the contract, plans, and specifications.

In no case will the amount of partial payments for materials on hand exceed the contract price for such materials or the contract price for the contract item in which the material is intended to be used.

No partial payment will be made for stored or stockpiled living or perishable plant materials.

The Contractor shall bear all costs associated with the partial payment of stored or stockpiled materials in accordance with the provisions of this subsection.

90-08 PAYMENT OF WITHHELD FUNDS. At the Contractor's option, if an Owner withholds retainage in accordance with the methods described in subsection 90-06 PARTIAL PAYMENTS, the Contractor may request that the Owner deposit the retainage into an escrow account. The Owner's deposit of retainage into an escrow account is subject to the following conditions:

a. The Contractor shall bear all expenses of establishing and maintaining an escrow account and escrow agreement acceptable to the Owner.

b. The Contractor shall deposit to and maintain in such escrow only those securities or bank certificates of deposit as are acceptable to the Owner and having a value not less than the retainage that would otherwise be withheld from partial payment.

c. The Contractor shall enter into an escrow agreement satisfactory to the Owner.

d. The Contractor shall obtain the written consent of the surety to such agreement.

90-09 ACCEPTANCE AND FINAL PAYMENT. When the contract work has been accepted in accordance with the requirements of the subsection titled FINAL ACCEPTANCE of Section 50, the Engineer will prepare the final estimate of the items of work actually performed. The Contractor shall approve the Engineer's final estimate or advise the Engineer of his/her objections to the final estimate which are based on disputes in measurements or computations of the final quantities to be paid under the contract as amended by change order or supplemental agreement. The Contractor and the Engineer shall resolve all disputes (if any) in the measurement and computation of final quantities to be paid within 30 calendar days of the Contractor's receipt of the Engineer's final estimate. If, after such 30-day period, a dispute still exists, the Contractor may approve the Engineer's estimate under protest of the quantities in dispute, and such disputed quantities shall be considered by the Owner as a claim in accordance with the subsection titled CLAIMS FOR ADJUSTMENT AND DISPUTES of Section 50.

After the Contractor has approved, or approved under protest, the Engineer's final estimate, final payment will be processed based on the entire sum, or the undisputed sum in case of approval under protest, determined to be due the Contractor less all previous payments and all amounts to be deducted under the provisions of the contract. All prior partial estimates and payments shall be subject to correction in the final estimate and payment.

If the Contractor has filed a claim for additional compensation under the provisions of the subsection titled CLAIMS FOR ADJUSTMENTS AND DISPUTES of Section 50 or under the provisions of this subsection, such claims will be considered by the Owner in accordance with local laws or ordinances. Upon final adjudication of such claims, any additional payment determined to be due the Contractor will be paid pursuant to a supplemental final estimate.

END OF SECTION 90

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Section 100 Contractor Quality Control Program

100-01 GENERAL. When the specification requires a Contractor Quality Control Program, the Contractor shall establish, provide, and maintain an effective Quality Control Program that details the methods and procedures that will be taken to assure that all materials and completed construction required by this contract conform to contract plans, technical specifications and other requirements, whether manufactured by the Contractor, or procured from subcontractors or vendors. Although guidelines are established and certain minimum requirements are specified herein and elsewhere in the contract technical specifications, the Contractor shall assume full responsibility for accomplishing the stated purpose.

The intent of this section is to enable the Contractor to establish a necessary level of control that will:

- a. Adequately provide for the production of acceptable quality materials.
- b. Provide sufficient information to assure both the Contractor and the Engineer that the specification requirements can be met.
- c. Allow the Contractor as much latitude as possible to develop his or her own standard of control.

The Contractor shall be prepared to discuss and present, at the preconstruction conference, his/her understanding of the quality control requirements. The Contractor shall not begin any construction or production of materials to be incorporated into the completed work until the Quality Control Program has been reviewed by the Engineer. No partial payment will be made for materials subject to specific quality control requirements until the Quality Control Program has been reviewed.

The quality control requirements contained in this section and elsewhere in the contract technical specifications are in addition to and separate from the acceptance testing requirements. Acceptance testing requirements are the responsibility of the Engineer.

100-02 DESCRIPTION OF PROGRAM.

a. General Description. The Contractor shall establish a Quality Control Program to perform inspection and testing of all items of work required by the technical specifications, including those performed by subcontractors. This Quality Control Program shall ensure conformance to applicable specifications and plans with respect to materials, workmanship, construction, finish, and functional performance. The Quality Control Program shall be effective for control of all construction work performed under this Contract and shall specifically include surveillance and tests required by the technical specifications, in addition to other requirements of this section and any other activities deemed necessary by the Contractor to establish an effective level of quality control.

b. Quality Control Program. The Contractor shall describe the Quality Control Program in a written document that shall be reviewed by the Engineer prior to the start of any production, construction, or off-site fabrication. The written Quality Control Program shall be submitted to the Engineer for review at least **7** calendar days before the **notice-to-proceed**.

The Quality Control Program shall be organized to address, as a minimum, the following items:

- a. Quality control organization
- b. Project progress schedule
- c. Submittals schedule
- d. Inspection requirements
- e. Quality control testing plan
- f. Documentation of quality control activities
- g. Requirements for corrective action when quality control and/or acceptance criteria are not met

The Contractor is encouraged to add any additional elements to the Quality Control Program that he/she deems necessary to adequately control all production and/or construction processes required by this contract.

100-03 QUALITY CONTROL ORGANIZATION. The Contractor Quality Control Program shall be implemented by the establishment of a separate quality control organization. An organizational chart shall be developed to show all quality control personnel and how these personnel integrate with other management/production and construction functions and personnel.

The organizational chart shall identify all quality control staff by name and function, and shall indicate the total staff required to implement all elements of the Quality Control Program, including inspection and testing for each item of work. If necessary, different technicians can be used for specific inspection and testing functions for different items of work. If an outside organization or independent testing laboratory is used for implementation of all or part of the Quality Control Program, the personnel assigned shall be subject to the qualification requirements of paragraph 100-03a and 100-03b. The organizational chart shall indicate which personnel are Contractor employees and which are provided by an outside organization.

The quality control organization shall consist of the following minimum personnel:

a. Program Administrator. The Program Administrator shall be a full-time employee of the Contractor, or a consultant engaged by the Contractor. The Program Administrator shall have a minimum of 5 years of experience in construction and shall have had prior quality control experience on a project of comparable size and scope as the contract.

b. Quality Control Technicians. A sufficient number of quality control technicians necessary to adequately implement the Quality Control Program shall be provided. These personnel shall be either engineers, engineering technicians, or experienced craftsman with qualifications in the appropriate field equivalent to NICET Level II or higher construction materials technician or highway construction technician and shall have a minimum of 2 years of experience in their area of expertise.

The quality control technicians shall report directly to the Program Administrator and shall perform the following functions:

- (1) Inspection of all materials, construction, plant, and equipment for conformance to the technical specifications, and as required by Section 100-06.
- (2) Performance of all quality control tests as required by the technical specifications and Section 100-07.

Certification at an equivalent level, by a state or nationally recognized organization will be acceptable in lieu of NICET certification.

c. Staffing Levels. The Contractor shall provide sufficient qualified quality control personnel to monitor each work activity at all times. Where material is being produced in a plant for incorporation into the work, separate plant and field technicians shall be provided at each plant and field placement location. The scheduling and coordinating of all inspection and testing must match the type and pace of work activity. The Quality Control Program shall state where different technicians will be required for different work elements.

100-04 PROJECT PROGRESS SCHEDULE. The Contractor shall submit a coordinated construction schedule for all work activities. The schedule shall be prepared as a network diagram in Critical Path Method (CPM), PERT, or other format, or as otherwise specified in the contract. As a minimum, it shall provide information on the sequence of work activities, milestone dates, and activity duration.

The Contractor shall maintain the work schedule and provide an update and analysis of the progress schedule on a twice monthly basis, or as otherwise specified in the contract. Submission of the work schedule shall not relieve the Contractor of overall responsibility for scheduling, sequencing, and coordinating all work to comply with the requirements of the contract.

100-05 SUBMITTALS SCHEDULE. The Contractor shall submit a detailed listing of all submittals (for example, mix designs, material certifications) and shop drawings required by the technical specifications. The listing can be developed in a spreadsheet format and shall include:

- a. Specification item number
- b. Item description
- c. Description of submittal
- d. Specification paragraph requiring submittal
- e. Scheduled date of submittal

100-06 INSPECTION REQUIREMENTS. Quality control inspection functions shall be organized to provide inspections for all definable features of work, as detailed below. All inspections shall be documented by the Contractor as specified by Section 100-07.

Inspections shall be performed daily to ensure continuing compliance with contract requirements until completion of the particular feature of work. These shall include the following minimum requirements:

a. During plant operation for material production, quality control test results and periodic inspections shall be used to ensure the quality of aggregates and other mix components, and to adjust and control mix proportioning to meet the approved mix design and other requirements of the technical specifications. All equipment used in proportioning and mixing shall be inspected to ensure its proper operating condition. The Quality Control Program shall detail how these and other quality control functions will be accomplished and used.

b. During field operations, quality control test results and periodic inspections shall be used to ensure the quality of all materials and workmanship. All equipment used in placing, finishing, and compacting shall be inspected to ensure its proper operating condition and to ensure that all such operations are in conformance to the technical specifications and are within the plan dimensions, lines, grades, and tolerances specified. The Program shall document how these and other quality control functions will be accomplished and used.

100-07 QUALITY CONTROL TESTING PLAN. As a part of the overall Quality Control Program, the Contractor shall implement a quality control testing plan, as required by the technical specifications. The testing plan shall include the minimum tests and test frequencies required by each technical specification Item, as well as any additional quality control tests that the Contractor deems necessary to adequately control production and/or construction processes.

The testing plan can be developed in a spreadsheet fashion and shall, as a minimum, include the following:

- a. Specification item number (for example, P-401)
- b. Item description (for example, Plant Mix Bituminous Pavements)
- c. Test type (for example, gradation, grade, asphalt content)
- d. Test standard (for example, ASTM or AASHTO test number, as applicable)
- e. Test frequency (for example, as required by technical specifications or minimum frequency when requirements are not stated)
- f. Responsibility (for example, plant technician)
- g. Control requirements (for example, target, permissible deviations)

The testing plan shall contain a statistically-based procedure of random sampling for acquiring test samples in accordance with ASTM D 3665. The Engineer shall be provided the opportunity to witness quality control sampling and testing.

All quality control test results shall be documented by the Contractor as required by Section 100-08.

100-08 DOCUMENTATION. The Contractor shall maintain current quality control records of all inspections and tests performed. These records shall include factual evidence that the required inspections or tests have been performed, including type and number of inspections or tests involved; results of inspections or tests; nature of defects, deviations, causes for rejection, etc.; proposed remedial action; and corrective actions taken.

These records must cover both conforming and defective or deficient features, and must include a statement that all supplies and materials incorporated in the work are in full compliance with the terms of the contract. Legible copies of these records shall be furnished to the Engineer daily. The records shall cover all work placed subsequent to the previously furnished records and shall be verified and signed by the Contractor's Program Administrator.

Specific Contractor quality control records required for the contract shall include, but are not necessarily limited to, the following records:

a. Daily Inspection Reports. Each Contractor quality control technician shall maintain a daily log of all inspections performed for both Contractor and subcontractor operations on a form acceptable to the Engineer. These technician's daily reports shall provide factual evidence that continuous quality control inspections have been performed and shall, as a minimum, include the following:

- (1) Technical specification item number and description;
- (2) Compliance with approved submittals;
- (3) Proper storage of materials and equipment;
- (4) Proper operation of all equipment;
- (5) Adherence to plans and technical specifications;
- (6) Review of quality control tests; and
- (7) Safety inspection.

The daily inspection reports shall identify inspections conducted, results of inspections, location and nature of defects found, causes for rejection, and remedial or corrective actions taken or proposed.

The daily inspection reports shall be signed by the responsible quality control technician and the Program Administrator. The Engineer shall be provided at least one copy of each daily inspection report on the work day following the day of record.

b. Daily Test Reports. The Contractor shall be responsible for establishing a system that will record all quality control test results. Daily test reports shall document the following information:

- (1) Technical specification item number and description
- (2) Test designation
- (3) Location
- (4) Date of test
- (5) Control requirements
- (6) Test results
- (7) Causes for rejection
- (8) Recommended remedial actions
- (9) Retests

Test results from each day's work period shall be submitted to the Engineer prior to the start of the next day's work period. When required by the technical specifications, the Contractor shall maintain statistical quality control charts. The daily test reports shall be signed by the responsible quality control technician and the Program Administrator.

100-09 CORRECTIVE ACTION REQUIREMENTS. The Quality Control Program shall indicate the appropriate action to be taken when a process is deemed, or believed, to be out of control (out of tolerance) and detail what action will be taken to bring the process into control. The requirements for corrective action shall include both general requirements for operation of the Quality Control Program as a whole, and for individual items of work contained in the technical specifications.

The Quality Control Program shall detail how the results of quality control inspections and tests will be used for determining the need for corrective action and shall contain clear sets of rules to gauge when a process is out of control and the type of correction to be taken to regain process control.

When applicable or required by the technical specifications, the Contractor shall establish and use statistical quality control charts for individual quality control tests. The requirements for corrective action shall be linked to the control charts.

100-10 SURVEILLANCE BY THE ENGINEER. All items of material and equipment shall be subject to surveillance by the Engineer at the point of production, manufacture or shipment to determine if the Contractor, producer, manufacturer or shipper maintains an adequate quality control system in conformance with the requirements detailed herein and the applicable technical specifications and plans. In addition, all items of materials, equipment and work in place shall be subject to surveillance by the Engineer at the site for the same purpose.

Surveillance by the Engineer does not relieve the Contractor of performing quality control inspections of either on-site or off-site Contractor's or subcontractor's work.

100-11 NONCOMPLIANCE.

a. The Engineer will notify the Contractor of any noncompliance with any of the foregoing requirements. The Contractor shall, after receipt of such notice, immediately take corrective action. Any notice, when delivered by the Engineer or his/her authorized representative to the Contractor or his/her authorized representative at the site of the work, shall be considered sufficient notice.

b. In cases where quality control activities do not comply with either the Contractor Quality Control Program or the contract provisions, or where the Contractor fails to properly operate and maintain an effective Quality Control Program, as determined by the Engineer, the Engineer may:

- (1) Order the Contractor to replace ineffective or unqualified quality control personnel or subcontractors.
- (2) Order the Contractor to stop operations until appropriate corrective actions are taken.

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Section 110 Method of Estimating Percentage of Material within Specification Limits (PWL)

110-01 GENERAL. When the specifications provide for acceptance of material based on the method of estimating percentage of material within specification limits (PWL), the PWL will be determined in accordance with this section. All test results for a lot will be analyzed statistically to determine the total estimated percent of the lot that is within specification limits. The PWL is computed using the sample average (\bar{X}) and sample standard deviation (S_n) of the specified number (n) of sublots for the lot and the specification tolerance limits, L for lower and U for upper, for the particular acceptance parameter. From these values, the respective Quality index, Q_L for Lower Quality Index and/or Q_U for Upper Quality Index, is computed and the PWL for the lot for the specified n is determined from Table 1. All specification limits specified in the technical sections shall be absolute values. Test results used in the calculations shall be to the significant figure given in the test procedure.

There is some degree of uncertainty (risk) in the measurement for acceptance because only a small fraction of production material (the population) is sampled and tested. This uncertainty exists because all portions of the production material have the same probability to be randomly sampled. The Contractor's risk is the probability that material produced at the acceptable quality level is rejected or subjected to a pay adjustment. The Owner's risk is the probability that material produced at the rejectable quality level is accepted.

It is the intent of this section to inform the contractor that, in order to consistently offset the contractor's risk for material evaluated, production quality (using population average and population standard deviation) must be maintained at the acceptable quality specified or higher. In all cases, it is the responsibility of the contractor to produce at quality levels that will meet the specified acceptance criteria when sampled and tested at the frequencies specified.

110-02 METHOD FOR COMPUTING PWL. The computational sequence for computing PWL is as follows:

- a. Divide the lot into n sublots in accordance with the acceptance requirements of the specification.
- b. Locate the random sampling position within the subplot in accordance with the requirements of the specification.
- c. Make a measurement at each location, or take a test portion and make the measurement on the test portion in accordance with the testing requirements of the specification.

- d.** Find the sample average (\bar{X}) for all subplot values within the lot by using the following formula:

$$\bar{X} = (x_1 + x_2 + x_3 + \dots + x_n) / n$$

Where: \bar{X} = Sample average of all subplot values within a lot

x_1, x_2 = Individual subplot values

n = Number of sublots

- e.** Find the sample standard deviation (S_n) by use of the following formula:

$$S_n = [(d_1^2 + d_2^2 + d_3^2 + \dots + d_n^2) / (n-1)]^{1/2}$$

Where: S_n = Sample standard deviation of the number of subplot values in the set

d_1, d_2 = Deviations of the individual subplot values x_1, x_2, \dots from the average value \bar{X}

that is: $d_1 = (x_1 - \bar{X}), d_2 = (x_2 - \bar{X}) \dots d_n = (x_n - \bar{X})$

n = Number of sublots

- f.** For single sided specification limits (that is, L only), compute the Lower Quality Index Q_L by use of the following formula:

$$Q_L = (\bar{X} - L) / S_n$$

Where: L = specification lower tolerance limit

Estimate the percentage of material within limits (PWL) by entering Table 1 with Q_L , using the column appropriate to the total number (n) of measurements. If the value of Q_L falls between values shown on the table, use the next higher value of PWL.

- g.** For double-sided specification limits (that is, L and U), compute the Quality Indexes Q_L and Q_U by use of the following formulas:

$$Q_L = (\bar{X} - L) / S_n$$

AND

$$Q_U = (U - \bar{X}) / S_n$$

Where: L and U = specification lower and upper tolerance limits

Estimate the percentage of material between the lower (L) and upper (U) tolerance limits (PWL) by entering Table 1 separately with Q_L and Q_U , using the column appropriate to the total number (n) of measurements, and determining the percent of material above P_L and percent of material below P_U for each tolerance limit. If the values of Q_L fall between values shown on the table, use the next higher value of P_L or P_U . Determine the PWL by use of the following formula:

$$PWL = (P_U + P_L) - 100$$

Where: P_L = percent within lower specification limit

P_U = percent within upper specification limit

EXAMPLE OF PWL CALCULATION

Project: Example Project

Test Item: Item P-401, Lot A.

A. PWL Determination for Mat Density.

1. Density of four random cores taken from Lot A.

$$A-1 = 96.60$$

$$A-2 = 97.55$$

$$A-3 = 99.30$$

$$A-4 = 98.35$$

$$n = 4$$

2. Calculate average density for the lot.

$$X = (x_1 + x_2 + x_3 + \dots + x_n) / n$$

$$X = (96.60 + 97.55 + 99.30 + 98.35) / 4$$

$$X = 97.95 \text{ percent density}$$

3. Calculate the standard deviation for the lot.

$$S_n = [((96.60 - 97.95)^2 + (97.55 - 97.95)^2 + (99.30 - 97.95)^2 + (98.35 - 97.95)^2) / (4 - 1)]^{1/2}$$

$$S_n = [(1.82 + 0.16 + 1.82 + 0.16) / 3]^{1/2}$$

$$S_n = 1.15$$

4. Calculate the Lower Quality Index Q_L for the lot. ($L=96.3$)

$$Q_L = (X - L) / S_n$$

$$Q_L = (97.95 - 96.30) / 1.15$$

$$Q_L = 1.4348$$

5. Determine PWL by entering Table 1 with $Q_L = 1.44$ and $n = 4$.

$$PWL = 98$$

B. PWL Determination for Air Voids.

1. Air Voids of four random samples taken from Lot A.

$$A-1 = 5.00$$

$$A-2 = 3.74$$

$$A-3 = 2.30$$

$$A-4 = 3.25$$

2. Calculate the average air voids for the lot.

$$X = (x_1 + x_2 + x_3 + \dots + x_n) / n$$

$$X = (5.00 + 3.74 + 2.30 + 3.25) / 4$$

$$X = 3.57 \text{ percent}$$

3. Calculate the standard deviation S_n for the lot.

$$S_n = [((3.57 - 5.00)^2 + (3.57 - 3.74)^2 + (3.57 - 2.30)^2 + (3.57 - 3.25)^2) / (4 - 1)]^{1/2}$$

$$S_n = [(2.04 + 0.03 + 1.62 + 0.10) / 3]^{1/2}$$

$$S_n = 1.12$$

4. Calculate the Lower Quality Index Q_L for the lot. ($L = 2.0$)

$$Q_L = (X - L) / S_n$$

$$Q_L = (3.57 - 2.00) / 1.12$$

$$Q_L = 1.3992$$

5. Determine P_L by entering Table 1 with $Q_L = 1.41$ and $n = 4$.

$$P_L = 97$$

6. Calculate the Upper Quality Index Q_U for the lot. ($U = 5.0$)

$$Q_U = (U - X) / S_n$$

$$Q_U = (5.00 - 3.57) / 1.12$$

$$Q_U = 1.2702$$

7. Determine P_U by entering Table 1 with $Q_U = 1.29$ and $n = 4$.

$$P_U = 93$$

8. Calculate Air Voids PWL

$$PWL = (P_L + P_U) - 100$$

$$PWL = (97 + 93) - 100 = 90$$

EXAMPLE OF OUTLIER CALCULATION (REFERENCE ASTM E 178)

Project: Example Project

Test Item: Item P-401, Lot A.

A. Outlier Determination for Mat Density.

1. Density of four random cores taken from Lot A arranged in descending order.

A-3 = 99.30

A-4 = 98.35

A-2 = 97.55

A-1 = 96.60

2. Use $n=4$ and upper 5 percent significance level of to find the critical value for test criterion = 1.463.

3. Use average density, standard deviation, and test criterion value to evaluate density measurements.

- a. For measurements greater than the average:

If (measurement - average)/(standard deviation) is less than test criterion,
then the measurement is not considered an outlier

For A-3, check if $(99.30 - 97.95) / 1.15$ is greater than 1.463.

Since 1.174 is less than 1.463, the value is not an outlier.

- b. For measurements less than the average:

If (average - measurement)/(standard deviation) is less than test criterion,
then the measurement is not considered an outlier.

For A-1, check if $(97.95 - 96.60) / 1.15$ is greater than 1.463.

Since 1.435 is less than 1.463, the value is not an outlier.

NOTE: In this example, a measurement would be considered an outlier if the density were:

Greater than $(97.95 + 1.463 \times 1.15) = 99.63$ percent

OR

less than $(97.95 - 1.463 \times 1.15) = 96.27$ percent.

Table 1. Table for Estimating Percent of Lot Within Limits (PWL)

Percent Within Limits (P_L and P_U)	Positive Values of Q (Q_L and Q_U)							
	n=3	n=4	n=5	n=6	n=7	n=8	n=9	n=10
99	1.1541	1.4700	1.6714	1.8008	1.8888	1.9520	1.9994	2.0362
98	1.1524	1.4400	1.6016	1.6982	1.7612	1.8053	1.8379	1.8630
97	1.1496	1.4100	1.5427	1.6181	1.6661	1.6993	1.7235	1.7420
96	1.1456	1.3800	1.4897	1.5497	1.5871	1.6127	1.6313	1.6454
95	1.1405	1.3500	1.4407	1.4887	1.5181	1.5381	1.5525	1.5635
94	1.1342	1.3200	1.3946	1.4329	1.4561	1.4717	1.4829	1.4914
93	1.1269	1.2900	1.3508	1.3810	1.3991	1.4112	1.4199	1.4265
92	1.1184	1.2600	1.3088	1.3323	1.3461	1.3554	1.3620	1.3670
91	1.1089	1.2300	1.2683	1.2860	1.2964	1.3032	1.3081	1.3118
90	1.0982	1.2000	1.2290	1.2419	1.2492	1.2541	1.2576	1.2602
89	1.0864	1.1700	1.1909	1.1995	1.2043	1.2075	1.2098	1.2115
88	1.0736	1.1400	1.1537	1.1587	1.1613	1.1630	1.1643	1.1653
87	1.0597	1.1100	1.1173	1.1192	1.1199	1.1204	1.1208	1.1212
86	1.0448	1.0800	1.0817	1.0808	1.0800	1.0794	1.0791	1.0789
85	1.0288	1.0500	1.0467	1.0435	1.0413	1.0399	1.0389	1.0382
84	1.0119	1.0200	1.0124	1.0071	1.0037	1.0015	1.0000	0.9990
83	0.9939	0.9900	0.9785	0.9715	0.9671	0.9643	0.9624	0.9610
82	0.9749	0.9600	0.9452	0.9367	0.9315	0.9281	0.9258	0.9241
81	0.9550	0.9300	0.9123	0.9025	0.8966	0.8928	0.8901	0.8882
80	0.9342	0.9000	0.8799	0.8690	0.8625	0.8583	0.8554	0.8533
79	0.9124	0.8700	0.8478	0.8360	0.8291	0.8245	0.8214	0.8192
78	0.8897	0.8400	0.8160	0.8036	0.7962	0.7915	0.7882	0.7858
77	0.8662	0.8100	0.7846	0.7716	0.7640	0.7590	0.7556	0.7531
76	0.8417	0.7800	0.7535	0.7401	0.7322	0.7271	0.7236	0.7211
75	0.8165	0.7500	0.7226	0.7089	0.7009	0.6958	0.6922	0.6896
74	0.7904	0.7200	0.6921	0.6781	0.6701	0.6649	0.6613	0.6587
73	0.7636	0.6900	0.6617	0.6477	0.6396	0.6344	0.6308	0.6282
72	0.7360	0.6600	0.6316	0.6176	0.6095	0.6044	0.6008	0.5982
71	0.7077	0.6300	0.6016	0.5878	0.5798	0.5747	0.5712	0.5686
70	0.6787	0.6000	0.5719	0.5582	0.5504	0.5454	0.5419	0.5394
69	0.6490	0.5700	0.5423	0.5290	0.5213	0.5164	0.5130	0.5105
68	0.6187	0.5400	0.5129	0.4999	0.4924	0.4877	0.4844	0.4820
67	0.5878	0.5100	0.4836	0.4710	0.4638	0.4592	0.4560	0.4537
66	0.5563	0.4800	0.4545	0.4424	0.4355	0.4310	0.4280	0.4257
65	0.5242	0.4500	0.4255	0.4139	0.4073	0.4030	0.4001	0.3980
64	0.4916	0.4200	0.3967	0.3856	0.3793	0.3753	0.3725	0.3705
63	0.4586	0.3900	0.3679	0.3575	0.3515	0.3477	0.3451	0.3432
62	0.4251	0.3600	0.3392	0.3295	0.3239	0.3203	0.3179	0.3161
61	0.3911	0.3300	0.3107	0.3016	0.2964	0.2931	0.2908	0.2892
60	0.3568	0.3000	0.2822	0.2738	0.2691	0.2660	0.2639	0.2624
59	0.3222	0.2700	0.2537	0.2461	0.2418	0.2391	0.2372	0.2358
58	0.2872	0.2400	0.2254	0.2186	0.2147	0.2122	0.2105	0.2093
57	0.2519	0.2100	0.1971	0.1911	0.1877	0.1855	0.1840	0.1829
56	0.2164	0.1800	0.1688	0.1636	0.1607	0.1588	0.1575	0.1566

Percent Within Limits (P _L and P _U)	Positive Values of Q (Q _L and Q _U)							
	n=3	n=4	n=5	n=6	n=7	n=8	n=9	n=10
55	0.1806	0.1500	0.1406	0.1363	0.1338	0.1322	0.1312	0.1304
54	0.1447	0.1200	0.1125	0.1090	0.1070	0.1057	0.1049	0.1042
53	0.1087	0.0900	0.0843	0.0817	0.0802	0.0793	0.0786	0.0781
52	0.0725	0.0600	0.0562	0.0544	0.0534	0.0528	0.0524	0.0521
51	0.0363	0.0300	0.0281	0.0272	0.0267	0.0264	0.0262	0.0260
50	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Percent Within Limits (P_L and P_U)	Negative Values of Q (Q_L and Q_U)							
	n=3	n=4	n=5	n=6	n=7	n=8	n=9	n=10
49	-0.0363	-0.0300	-0.0281	-0.0272	-0.0267	-0.0264	-0.0262	-0.0260
48	-0.0725	-0.0600	-0.0562	-0.0544	-0.0534	-0.0528	-0.0524	-0.0521
47	-0.1087	-0.0900	-0.0843	-0.0817	-0.0802	-0.0793	-0.0786	-0.0781
46	-0.1447	-0.1200	-0.1125	-0.1090	-0.1070	-0.1057	-0.1049	-0.1042
45	-0.1806	-0.1500	-0.1406	-0.1363	-0.1338	-0.1322	-0.1312	-0.1304
44	-0.2164	-0.1800	-0.1688	-0.1636	-0.1607	-0.1588	-0.1575	-0.1566
43	-0.2519	-0.2100	-0.1971	-0.1911	-0.1877	-0.1855	-0.1840	-0.1829
42	-0.2872	-0.2400	-0.2254	-0.2186	-0.2147	-0.2122	-0.2105	-0.2093
41	-0.3222	-0.2700	-0.2537	-0.2461	-0.2418	-0.2391	-0.2372	-0.2358
40	-0.3568	-0.3000	-0.2822	-0.2738	-0.2691	-0.2660	-0.2639	-0.2624
39	-0.3911	-0.3300	-0.3107	-0.3016	-0.2964	-0.2931	-0.2908	-0.2892
38	-0.4251	-0.3600	-0.3392	-0.3295	-0.3239	-0.3203	-0.3179	-0.3161
37	-0.4586	-0.3900	-0.3679	-0.3575	-0.3515	-0.3477	-0.3451	-0.3432
36	-0.4916	-0.4200	-0.3967	-0.3856	-0.3793	-0.3753	-0.3725	-0.3705
35	-0.5242	-0.4500	-0.4255	-0.4139	-0.4073	-0.4030	-0.4001	-0.3980
34	-0.5563	-0.4800	-0.4545	-0.4424	-0.4355	-0.4310	-0.4280	-0.4257
33	-0.5878	-0.5100	-0.4836	-0.4710	-0.4638	-0.4592	-0.4560	-0.4537
32	-0.6187	-0.5400	-0.5129	-0.4999	-0.4924	-0.4877	-0.4844	-0.4820
31	-0.6490	-0.5700	-0.5423	-0.5290	-0.5213	-0.5164	-0.5130	-0.5105
30	-0.6787	-0.6000	-0.5719	-0.5582	-0.5504	-0.5454	-0.5419	-0.5394
29	-0.7077	-0.6300	-0.6016	-0.5878	-0.5798	-0.5747	-0.5712	-0.5686
28	-0.7360	-0.6600	-0.6316	-0.6176	-0.6095	-0.6044	-0.6008	-0.5982
27	-0.7636	-0.6900	-0.6617	-0.6477	-0.6396	-0.6344	-0.6308	-0.6282
26	-0.7904	-0.7200	-0.6921	-0.6781	-0.6701	-0.6649	-0.6613	-0.6587
25	-0.8165	-0.7500	-0.7226	-0.7089	-0.7009	-0.6958	-0.6922	-0.6896
24	-0.8417	-0.7800	-0.7535	-0.7401	-0.7322	-0.7271	-0.7236	-0.7211
23	-0.8662	-0.8100	-0.7846	-0.7716	-0.7640	-0.7590	-0.7556	-0.7531
22	-0.8897	-0.8400	-0.8160	-0.8036	-0.7962	-0.7915	-0.7882	-0.7858
21	-0.9124	-0.8700	-0.8478	-0.8360	-0.8291	-0.8245	-0.8214	-0.8192
20	-0.9342	-0.9000	-0.8799	-0.8690	-0.8625	-0.8583	-0.8554	-0.8533
19	-0.9550	-0.9300	-0.9123	-0.9025	-0.8966	-0.8928	-0.8901	-0.8882
18	-0.9749	-0.9600	-0.9452	-0.9367	-0.9315	-0.9281	-0.9258	-0.9241
17	-0.9939	-0.9900	-0.9785	-0.9715	-0.9671	-0.9643	-0.9624	-0.9610
16	-1.0119	-1.0200	-1.0124	-1.0071	-1.0037	-1.0015	-1.0000	-0.9990
15	-1.0288	-1.0500	-1.0467	-1.0435	-1.0413	-1.0399	-1.0389	-1.0382
14	-1.0448	-1.0800	-1.0817	-1.0808	-1.0800	-1.0794	-1.0791	-1.0789
13	-1.0597	-1.1100	-1.1173	-1.1192	-1.1199	-1.1204	-1.1208	-1.1212
12	-1.0736	-1.1400	-1.1537	-1.1587	-1.1613	-1.1630	-1.1643	-1.1653
11	-1.0864	-1.1700	-1.1909	-1.1995	-1.2043	-1.2075	-1.2098	-1.2115
10	-1.0982	-1.2000	-1.2290	-1.2419	-1.2492	-1.2541	-1.2576	-1.2602
9	-1.1089	-1.2300	-1.2683	-1.2860	-1.2964	-1.3032	-1.3081	-1.3118
8	-1.1184	-1.2600	-1.3088	-1.3323	-1.3461	-1.3554	-1.3620	-1.3670
7	-1.1269	-1.2900	-1.3508	-1.3810	-1.3991	-1.4112	-1.4199	-1.4265
6	-1.1342	-1.3200	-1.3946	-1.4329	-1.4561	-1.4717	-1.4829	-1.4914
5	-1.1405	-1.3500	-1.4407	-1.4887	-1.5181	-1.5381	-1.5525	-1.5635

Percent Within Limits (P_L and P_U)	Negative Values of Q (Q_L and Q_U)							
	n=3	n=4	n=5	n=6	n=7	n=8	n=9	n=10
4	-1.1456	-1.3800	-1.4897	-1.5497	-1.5871	-1.6127	-1.6313	-1.6454
3	-1.1496	-1.4100	-1.5427	-1.6181	-1.6661	-1.6993	-1.7235	-1.7420
2	-1.1524	-1.4400	-1.6016	-1.6982	-1.7612	-1.8053	-1.8379	-1.8630
1	-1.1541	-1.4700	-1.6714	-1.8008	-1.8888	-1.9520	-1.9994	-2.0362

END OF SECTION 110

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Section 120 Nuclear Gauges

120-01 TESTING. When the specifications provide for nuclear gauge acceptance testing of material for Items P-152, P-154, P-208, and P-209, the testing shall be performed in accordance with this section. At each sampling location, the field density shall be determined in accordance with ASTM D 6938 using the Direct Transmission Method. The nuclear gauge shall be calibrated in accordance with ASTM D 6938. Calibration and operation of the gauge shall be in accordance with the requirements of the manufacturer. The operator of the nuclear gauge must show evidence of training and experience in the use of the instrument. The gauge shall be standardized daily in accordance with ASTM standards.

When using the nuclear method, ASTM D 6938 shall be used to determine the moisture content of the material. The calibration curve furnished with the nuclear gauges shall be checked in accordance with ASTM standards. The calibration checks shall be made at the beginning of a job and at regular daily intervals.

The material shall be accepted on a lot basis. Each Lot shall be divided into eight (8) sublots when ASTM D 6938 is used.

120-02. When PWL concepts are incorporated, compaction shall continue until a PWL of 90 percent or more is achieved using the lower specification tolerance limits (L) below.

The percentage of material within specification limits (PWL) shall be determined in accordance with the procedures specified in Section 110 of the General Provisions.

The lower specification tolerance limit (L) for density shall be:

Specification Item Number	Specification Tolerance (L) for Density, <u>(percent of laboratory maximum)</u>
Item P-152	90.5 for cohesive material, 95.5 for non-cohesive
Item P-154	95.5
Item P-208	97.0
Item P-209	97.0

If the PWL is less than 90 percent, the lot shall be reworked and recompacted by the Contractor at the Contractor's expense. After reworking and recompaction, the lot shall be resampled and retested. Retest results for the lot shall be reevaluated for acceptance. This procedure shall continue until the PWL is 90 percent or greater.

120-03 VERIFICATION TESTING. (For Items P-152 and P-154 only.) The Engineer will verify the maximum laboratory density of material placed in the field for each lot. A minimum of one test will be made for each lot of material at the site. The verification process will consist of; (1) compacting the material and determining the dry density and moisture-density in accordance with ASTM D 698, and (2) comparing the result with the laboratory moisture-density curves for the material being placed. This verification process is commonly referred to as a "one-point Proctor".

If the material does not conform to the existing moisture-density curves, the Engineer will establish the laboratory maximum density and optimum moisture content for the material in accordance with ASTM D 698.

Additional verification tests will be made, if necessary, to properly classify all materials placed in the lot.

The percent compaction of each sampling location will be determined by dividing the field density of each subplot by the laboratory maximum density for the lot.

END OF SECTION 120

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SUPPLEMENTAL CONTRACT ARTICLES

I. CONTRACT DOCUMENT DRAWINGS

Attention shall be directed to the Contract Article and the Supplemental Contract Articles for complete definition and enumeration of the Contract Documents.

A. Dimensions

The drawings are made to scale, unless otherwise noted, but all working dimensions shall be taken from the figured dimensions or by actual measurements at the work, and in no case by scaling the prints. The Contractor (and his/her subcontractors) shall study and compare all drawings and verify all figures before laying out or constructing the work and shall be responsible for any and all errors in the Contract work which might have been avoided thereby. Whether or not an error is believed to exist, deviations from the drawings and the dimensions given thereon shall be made only after approval in writing is obtained from the Engineer. The Contractor (and his/her subcontractors) shall take all measurements of existing established conditions notwithstanding the figured dimensions are not in agreement with the Contractor's (or his/her subcontractors) measurements, the Engineer shall be immediately notified and the Engineer will promptly adjust same.

B. Diagrammatic Drawings

1. Work and Materials Included

Plans or drawings where the work is shown diagrammatically indicate approved working systems. Every piece of material, fitting, fixture or small equipment is not shown nor is every difficulty or interference that may be encountered. To carry out the true intent and purpose of the Contract Documents, all necessary parts to make complete, approved working systems, or installations shall be included as if detailed on the drawings.

2. Location of Construction

The location of construction or installations shown on the drawings, unless exactly dimensioned, shall be considered as approximate only. The Contractor (and his/her subcontractors) shall adjust the position of the construction and installation in accordance with good working practices and as directed or approved by the Engineer to meet interferences, provide proper clearance and provide proper access space for operations and maintenance.

C. Typical Details

Where shown on the drawings, typical details shall apply to each and every item of the Contract work where such items are incorporated and the detail is applicable. Unless noted otherwise, such typical details shall be applicable in full.

II. SPECIAL INSPECTION REQUIREMENTS

A. The project will be financially aided by grants from the Federal Aviation Administration (U. S. Government) and from the State of New Hampshire acting through the Department of Transportation, Bureau of Aeronautics. All work done under this Contract will be subject to the rules and regulations and the approval of said Administration and Department. The Contractor shall provide authorized representatives of said Administration and Department with proper access to the work for inspection purposes at any time during the preparation for or progress on the Contract work.

B. The Contractor shall throughout the course of the work give proper notice to the Engineer and all others having jurisdiction of his/her schedule of operations. It shall be the Contractor's responsibility to have all parts of the work inspected and approved by the proper authorities as required.

C. All applicable inspection and certification requirements of the Standard Specifications referred to herein will be enforced, in addition to any other inspections or certifications deemed necessary by the Engineer.

III. "OR EQUAL" CLAUSE

Whenever a material, article or piece of equipment is identified on the plans or in the specifications by reference to manufacturer's or vendor's names, trade names, catalogue numbers, etc., it is intended merely to establish a standard; and, any material, article, or equipment of other manufacturers and vendors which will perform adequately the duties imposed by the general design will be considered equally acceptable provided the material, article, or equipment so proposed, is, in the opinion of the Engineer, of equal substance and function. It shall not be purchased or installed by the Contractor without the Engineer's written approval.

IV. PROTECTION OF LIVES AND HEALTH

In order to protect the lives and health of his/her employees under the contract, the Contractor shall comply with all pertinent provisions of the "Manual of Accident Prevention in Construction" issued by the Associated General Contractors of America, Inc., and shall maintain an accurate record of all cases of death, occupational disease, and injury requiring medical attention or causing loss of time from work, arising out of and in the course of employment on work under the Contract. He/she alone shall be responsible for the safety, efficiency, and adequacy of his/her plant, appliances, and methods, and for any damage which may result from their failure of their improper construction, maintenance or operation.

V. INSURANCE

A. General

1. The Contractor, under any circumstances, shall not commence work under this Contract until he/she has obtained all the insurance required by these Specifications. The Owner shall be named as certificate holder and the Owner, New Hampshire Department of Transportation and the Engineer shall be named as additional insured on all policies. The types and minimum amounts of the insurance to be provided by the contractor shall be as specified below.

B. Types and Minimum Limits

1. Worker's Compensation Insurance

The Contractor shall procure and shall maintain during the life of this Contract Workmen's Compensation Insurance as detailed below for all of his/her employees to be engaged in work at the site of the project under this Contract and, in case of any such work sublet, the Contractor shall require the subcontractor similarly to provide Workmen's Compensation Insurance for all the latter's employees to be engaged in such work unless such employees are covered by the protection afforded by the Contractor's Workmen's Compensation Insurance.

In case any class of employees engaged in hazardous work on this project under this Contract is not protected under the Workmen's Compensation Statute, the Contractor shall provide and shall cause each subcontractor to provide adequate employer's liability insurance for the protection of such of his/her employees as are not otherwise protected.

Worker's Compensation:

Each Accident:	\$ 100,000
Disease-Policy Limit:	\$ 500,000
Disease-Each Employee:	\$ 100,000

2. Contractor's Commercial General Liability and Commercial Automobile Liability

The Contractor shall procure and shall maintain during the life of this Contract, Contractor's Commercial General Liability and Commercial Automobile Liability insurance. The Commercial General Liability policies shall be extended to cover completed operations for a period of one year following acceptance of the contract work. The limits of insurance coverage shall be as follows:

Commercial General Liability:

General Aggregate:	\$2,000,000
Products-Completed Operations Aggregate:	\$2,000,000
Personal and Advertising:	\$1,000,000
Each Occurrence Injury:	\$1,000,000
Fire Damage (Any One Fire):	\$ 50,000
Medical Expense (Any One Person):	\$ 10,000

Commercial Automobile Liability:

Combined Single Limit:	\$1,000,000
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The insurance required under this subparagraph shall provide adequate protection for the contractor against damage claims which may arise from operation under this contract, whether such operations be by the insured or by anyone directly or indirectly employed by him/her and also against any damage or injury to aircraft or persons in aircraft operating on or near the project site. The insurance shall also cover damage or injury resulting from the use, storage, handling or transportation of explosives in connection with the contract work.

3. Subcontractor's General Commercial Liability and Commercial Automobile Liability Insurance

The Contractor shall either (a) require each of his/her subcontractors to procure, and to maintain during the life of his/her subcontract, Subcontractor's Commercial General Liability and Commercial Automobile Liability Insurance of the types and amount specified in (2) above or (b) insure the activities of all subcontractors under the Contractor's own policies specified in (2) above.

4. Builder's Risk Insurance and/or All Risk Property Damage Insurance (Fire and Extended Coverage)

Until the project is completed and accepted by the Owner the Contractor is required to maintain Builder's Risk Insurance and/or All Property Damage Insurance (Fire and Extended Coverage) on a 100 percent completed value basis on all materials and workmanship utilized all portions of the project for the benefit of the Owner, the Contractor and subcontractor as their interests may appear.

5. Pollution Liability Insurance

The Contractor shall procure and shall maintain during the life of this Contract, Pollution Liability insurance in the amount of \$1,000,000. The insurance shall be extended to cover completed operations for a period of one year following acceptance of the contract work.

6. Owner's & Contractor's Protective Insurance

The Contractor shall procure and maintain during the life of this Contract at his/her own expense and shall furnish to the Owner a separate Owner's & Contractor's Protective Policy providing public liability and property damage with the following minimum limits:

For bodily injury:

Each person	\$1,000,000
Each accident	\$1,000,000

For property damage:

Each accident	\$1,000,000
Aggregate	\$2,000,000

C. Insurance Certificates

1. The Contractor shall furnish the Owner at the time of executing the Contract, Certificates of Insurance showing clearly the types and amounts of insurance coverage, the operations covered, effective dates, and expiration dates for all of the required insurance coverage. Certificates of Insurance shall be endorsed essentially as follows: "None of the coverage indicated on the Certificate will be modified or cancelled without thirty days prior written notice to the Owner." The Certificates of Insurance shall clearly state all of the requirements specified in all these subparagraphs and shall state the month and year of the Contract.

Acceptance of the insurance certificates by the Owner shall not relieve or decrease the liability of the Contractor under the Contract.

VI. SPECIAL HAZARDS

The Contractor's and Subcontractor's Public Liability, Property Damage, Vehicle Liability, and Vehicle Property Damage insurance coverage shall provide adequate protection against the following special hazards:

1. Damage or injury to aircraft or persons in aircraft operating on or near the project site, resulting from any operations under this Contract.
2. Damage or injury resulting from the use, storage, handling or transportation of explosives in connection with the Contract work.

VII. WORK LIMITATIONS (NOISE)

Per Section 12 *Laws and Regulations* of the Information to Bidders the contractor shall be bound by the City of Concord Municipal Code of Ordinances Section 13-6-9 *Construction Noise*. The contractor shall consider Construction noise restrictions when preparing his/her schedule.

a) Construction Noise. The generation of any noise from construction activity as defined in Section 13-6-2 or from a construction site that is clearly audible at a dwelling in any district is prohibited, except for noise generated:

- (1) Between 7:00 a.m. and 7:00 p.m. on weekdays; or
- (2) Between 9:00 a.m. and 7:00 p.m. on Saturdays; or
- (3) Between 9:00 a.m. and 7:00 p.m. on Sundays, and on the following holidays: January 1, Memorial Day or on a date to coincide with the federal observance if it is held on a different day, July 4, Labor Day, Thanksgiving Day, or Christmas Day from work done by a resident at the resident's dwelling; or
- (4) Between 9:00 a.m. and 7:00 p.m. on a holiday as defined by RSA 288:1 as the third Monday in January, known as Martin Luther King Jr. Civil Rights' Day; the third Monday in February, known as Washington's Birthday; the second Monday in October, known as Columbus Day; the day on which the biennial election is held; and November 11, known as Veterans' Day.

(b) Exceptions.

- (1) Sections 13-6-8 and 13-6-9 shall not apply to routine or emergency City work including solid waste collection, street sweeping, street and sidewalk plowing, snow removal, and other periodic work necessary for the City to maintain its public streets and infrastructure.
- (2) Emergency work as defined in Section 13-6-2 is exempt from hours of operations' restrictions.
- (3) The Code Administrator may, in writing, grant exceptions to these provisions when the work, in the Code Administrator's sole discretion, is of an urgent or otherwise necessary for or in the interest of public or private safety and convenience.

In accordance with section VII.b.3 the contractor may request, in writing, permission to work outside of the hours listed in section VII.a. In the event such request is denied it shall not be grounds for additional contract time, additional compensation, adjustments, or be considered grounds for delay.

VIII. WORK RESTRICTION (NASCAR RACES)

The contractor shall not close Runway 17-35, work within the Runway 35 localizer critical area, work within the Runway 17-35 safety, close Taxiway A, or work within the Taxiway A object free area (TOFA) from 3-days preceding through one day after the NASCAR races at the NH Motor Speedway in Loudon, NH. The contractor shall identify the race dates for the 2013 and 2014 seasons (and rain dates if applicable) plan his/her work accordingly.

- a) The contractor shall consider NASCAR RACE work restrictions when preparing his/her schedule.

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TECHNICAL SPECIFICATIONS

ITEM G-001
SUMMARY OF WORK AND SPECIAL WORK REQUIREMENTS

CONTRACT DOCUMENTS

This section of these specifications is a part of the Contract Documents as defined in the Contract Articles. All applicable parts of the balance of the Contract Documents are equally as binding for this as for all other sections.

G-001-1.0 GENERAL. The special requirements set forth in this section of these specifications shall govern any aspect of the contract work where such requirements are deemed applicable by the Owner or the Engineer. The purpose of these requirements is to insure that the contract work does not damage private property or create any hazard to aircraft operations, and point out special coordination or schedule conditions that the Contractor should be aware of. It shall be the Contractor's responsibility to conduct all work in strict accordance with the special requirements set forth herein and to fully cooperate with the Owner and the Engineer in every way necessary to fulfill the purposes of these requirements as set forth above.

G-001-2.0 PROJECT DESCRIPTION. The project will consist of the construction of approximately 4,300 linear feet of new taxiway. In general, the project includes erosion and sediment control measures, clearing and grubbing, tree cutting, installation of drainage pipes and structures, construction of stormwater infiltration fields, excavation and embankment, stripping and processing of topsoil for onsite reuse, construction of base and subbase courses, bituminous concrete pavement, installation of taxiway edge lighting system, installation of a new PAPI, chain link fence installation, and pavement markings.

G-001-3.0 PROJECT SCHEDULE. Upon execution of the contract, the Owner will issue a written "Notice to Proceed" which will specify an effective date for the Contractor to begin work at the site. The bidder must agree to commence work by the date to be specified in the written "Notice to Proceed" from the Owner, and to fully complete the project within the following time tables:

Base Bid: 60 Calendar Days
Additive Alternate 1: 75 Calendar Days
Additive Alternate 2: 30 Calendar Days

G-001-4.0 LIQUADATED DAMAGES. If the work remains incomplete after the time specified in paragraph 001-3.1 for the completion of all work, the Contractor shall pay the Owner as liquidated damages the sum of **five hundred dollars (\$500.00) plus engineering/inspection costs** per day for each and every calendar day that the work remains incomplete beyond the above specified time as provided in the Contract Articles.

G-001-5.0 DAILY SCHEDULES REQUIRED. To facilitate the specific requirements and intent of this section, the Contractor shall prepare and submit a schedule of operations for each work area. The schedule shall be given to the Owner one week prior to the commencing of any work. The schedule shall be subject to the approval of the Owner, and shall include as a minimum, the following:

1. Major work items to be accomplished.
2. Subcontractors to be on site.
3. Number of personnel to be on site.
4. Type and quantity of equipment to be on site.
5. Areas of the site where construction is scheduled.
6. Any anticipated closing of facilities that will be required.
7. Other information requested by the Owner.

The Owner may disallow work in areas not included in the current work schedule. The Contractor shall have a competent superintendent on the work site **at all times** who is fully authorized to act as his/her agent on the work. The superintendent shall be capable of reading and thoroughly understanding the plans and specifications and shall receive and fulfill instructions from the Engineer or the Owner.

The Contractor shall provide the Owner with the name(s) and telephone number(s) of a person or persons that can be contacted before or after work hours for emergency situations effecting the construction. The Contractor shall be "on call" at all times during the length of the construction period.

G-001-6.0 AIRCRAFT OPERATIONS AREA. Outside of the defined Work Areas, the Contractor shall keep his/her personnel and equipment outside the object free area for all runways and taxiways. No equipment will be allowed to penetrate the runway approach or transitional surfaces defined in 49 CFR Part 77.

The closing of facilities will be as specified in Section 7.0, Sequence of Work.

G-001-7.0 SEQUENCE OF WORK. The Contractor shall, immediately after award of the contract, work out in detail a Construction Progress Schedule covering all parts of the work which shall be submitted for approval, to the Engineer before the Pre-Construction Conference. The Pre-Construction Conference will not be held until a Construction Progress Schedule has been submitted to the Engineer. The Construction Progress Schedule shall state the items of work and shall forecast the dates for carrying out each part of the work to be done.

The work for the Contract shall be prosecuted in such an order and manner as the Engineer shall approve at a Pre-Construction Conference.

The construction operations in the various work areas have been carefully designed and coordinated with anticipated airport operational requirements to minimize interference with airport operations. It is imperative that the Contractor plan his/her work to confine his/her activity to the specified work limits for each work area and observe clearance lines as shown on the General and Phasing Plans and meet the dates set in the schedule.

The Contractor shall place all temporary lighting, barricades and temporary erosion control measures around the work area as specified on the Contract Drawings, prior to the commencement of work. The Contractor shall then proceed with the actual construction of the project in any order and manner, provided that he adheres to all other work site constraints and conditions as stipulated here and elsewhere in the Contract documents.

The Owner reserves the right to eliminate or reorder the work associated with any or all of the Work Areas. Such elimination or reordering of the work shall not constitute a basis for claim by the Contractor for damage, delay, adjustment of unit prices, or additional Contract time.

G-001-8.0 OPEN TRENCHES OR EXCAVATIONS. The Contractor will not be permitted to leave any trenches or other excavations open at night, on weekends or at other times when the Contractor is not on the site. In addition, no excavations exceeding three (3") inches in depth shall be left open within the object free areas described in section 6.0, Aircraft Operations Areas, while the runways, taxiways, and aprons are in use unless the excavations are covered with approved plates. Steel plates shall be capable of bearing the heaviest aircraft using the airport over the span in which they are to be used. The Contractor shall keep the length of open trenches covered with steel plates to a minimum, but in no case shall the length exceed distance between two adjacent manholes of catch basins.

All excavations shall be backfilled and the pavement repaired and properly cured prior to the area being re-opened to traffic.

Prior to the close of work each day, the Contractor shall ensure that the work area within the safety areas of the runways, taxiways and aprons are graded away from the pavements at a maximum slope of 5% and shall be left in such condition that it will drain readily and effectively and will not pose a hazard to aircraft. No piles of soil shall be left unspread, no sharp changes in grade will be permitted, and the surface shall be thoroughly compacted.

G-001-9.0 STORAGE AREA AND EQUIPMENT AREA. The area for the location of the Engineers/Contractors Field Office and for storing materials and servicing, repairing and parking construction equipment is located where shown on the drawings.

The Contractor will be required to return all equipment to the appropriate Contractors staging area at the end of work each day, unless otherwise approved by the Engineer. All equipment booms shall be lowered at the close of each day's work. All equipment will be parked in the staging area at the close of work each day and whenever it is not in use.

The Contractor (and his subcontractors) shall provide all necessary temporary fencing and gates to protect materials and equipment from pilferage. The Owner will not be responsible for any vandalized equipment or material stored on the airport property.

Any area occupied by the Contractor shall be maintained in a clean and orderly condition satisfactory to the Engineer. Particular attention shall be given to the elimination of combustible rubbish or debris in the areas and none shall be left exposed overnight or at other periods of time when the work is shut down.

At the completion of the contract, all Contractors and subcontractors facilities will be removed promptly in a workmanlike manner, and the area left clean and free of all debris or surplus material.

G-001-10.0 HAUL ROUTES. When public highways must be used for haul routes, it will become the Contractors responsibility to obtain the proper permits needed for this function and to obey all rules and regulations pertinent to the public highways.

Haul routes on the airport shall be as shown on the contract drawings. The Contractor shall stake or otherwise clearly delineate the haul routes. The Contractors vehicles and equipment shall operate within the limits of the marked haul route.

Contractors vehicles will not be allowed access to portions of the airport other than the work and staging areas.

All paved haul roads or access roads shall be kept clean at all times to prevent the accumulation of dirt and mud and the generation of dust by sweeping, washing or other methods as directed by the Engineer. Unpaved haul roads, if any, shall be maintained by blading and filling when directed by the Engineer and dust shall be controlled at all times.

All paved haul roads disturbed shall be restored to their original condition or better before the contract will be considered complete. All restoration and dust control on haul roads shall be at the Contractors expense.

All non-paved areas on the airport which are disturbed by the Contractors operations shall be scarified or otherwise loosened to a depth not less than five (5") inches (127 mm). Clods shall be broken and the top three (3") inches (76 mm) of soil shall be worked into a satisfactory seedbed by discing, or by use of cultipackers, rollers, drags, harrows, or other appropriate means. This area shall then be seeded, fertilized and mulched.

G-001-11.0 AIRPORT OPERATION AND SAFETY REQUIREMENTS. Normal airport operation will be conducted on the airfield during construction and the work shall be carried on in such a manner as to not interfere with the necessary operation of the airport. The Contractor shall take all precautions necessary to ensure the safety of operating aircraft, as well as his/her own equipment and personnel. In addition to the guidelines set forth in these specifications, the Contractor shall work and operate in accordance with FAA Advisory Circular 150/5370-2F, *Operational Safety on Airports During Construction*.

No construction operations shall be carried on within the object free area of any active runway or taxiway or within the limits of active runway approach zones unless prior approval has been obtained. When permission has been granted to work inside these limits, no equipment shall be left within the lines when not actually working. During lunch hour breaks in the daily work schedule, and the days when work is not permitted or is not progressing, the equipment shall be located outside of these restriction lines. All booms shall be lowered when the equipment is not in operation. No construction operations, including an open flame such as welding or burning, shall be carried on near any aircraft. Equipment is to be stored in the Contractors staging areas during nights and weekends when no work is scheduled.

Each Contractors motorized vehicle operating in an aircraft movement area shall be equipped with an amber flashing light and a 3-foot square (1 m) flag consisting of international orange and white squares not less than one (1') foot (305 mm) square displayed in full view above the vehicle.

In addition, all Contractors vehicles shall have the company identification plainly visible on both sides of the vehicle in order to identify the vehicle.

The Contractor shall obey all instructions as to the operation and routes to be taken by equipment traveling on airport property. Any signs, lights, signals, markings, traffic control and other devices which may be required shall be provided and maintained by the Contractor during the course of the work, subject to the approval of the Engineer. No aircraft pavement, or navigational aid currently in service shall be left out of service overnight unless closed to all airport operations. The Contractor shall check all permanent and temporary lighting to ensure its operating condition before leaving the job each day.

The Contractor shall stake and permanently mark on the ground with a readily recognizable marking (football field marking or similar material) the restriction lines parallel to the taxiways and runways adjacent to the work and the approach zone limits so that workmen can readily recognize the limitations.

G-001-12.0 MAINTENANCE OF THE CONSTRUCTION SITE. The Contractor shall keep the construction site free of paper, boxes, and other debris which could be blown onto runways and taxiways.

All airport pavements shall be kept clear and clean at all times. All rocks, mud, and other debris carried onto the airport pavement by the Contractor's equipment must be reported to the Engineer or the Airport Director's office. The Airport Director will then close the affected area to air traffic and the Contractor will immediately sweep the area to the satisfaction of the Airport Director.

The Contractor shall maintain at the construction site, the equipment for the application of water to control dust within the construction site and on haul roads. The equipment shall be equipped with a shut-off control valve which can be operated from the cab by the operator. The Contractor shall apply water for dust control as necessary to prevent dust from the construction site and/or haul roads from being a hazard to aircraft and from being a nuisance to the public and as directed by the Engineer. The Contractor shall maintain at the job site at all times while the construction under this contract is in progress, a self-propelled, self-contained sweeper with not less than a 10-foot broom with a 4-cubic yard capacity approved by the Engineer. The sweeper shall operate as necessary to keep active aircraft pavements, access roads and the work areas clean. At the close of each day's work, all active aircraft pavements and airport paved roads used or dirtied by the Contractor shall again be swept.

The Contractor shall also be responsible for supplying any other equipment as may be necessary to clean all areas that are contaminated as a result of his/her operations to the complete satisfaction of the Engineer and the Airport Director.

Trucks loaded in the construction area shall have loads trimmed as necessary to ensure that no particles, stones or debris will fall off and that no legal load limits are exceeded.

The Contractor shall be particularly careful not to track foreign material onto pavements outside of and within the airport (e.g., tack-coat). The Contractor shall be responsible for removing foreign materials from vehicle tires prior to the vehicle leaving its work area.

G-001-13.0 UNDERGROUND UTILITIES AND CABLES. Prior to commencement of any excavation the Contractor shall coordinate all work on and in the vicinity of the underground utilities and cables with the appropriate agencies as listed in the drawings. The Contractor shall furnish and install all materials necessary to protect existing underground utilities and cables that are to remain and to make any temporary connections necessary to maintain operations of the underground utilities and cables that are to be relocated until the permanent relocation can be made.

The Contractor shall repair, at his/her own expense, any underground cables damaged by his/her operations including any damage done by driving his/her equipment over existing underground cables.

G-001-14.0 MAINTENANCE OF THE EXISTING AIRFIELD LIGHTING. All existing lighting systems on the airport facilities which are open to aircraft shall be operational each night and during inclement weather throughout the construction period.

It shall be the responsibility of the Contractor to check the operation of the existing lights each day, to notify the Engineer and the Airport Director's office of any problems and make any repairs necessary due to his/her operation.

The Contractor shall furnish and install all materials necessary to construct and install the temporary lighting and make any temporary connections to keep the existing airfield lighting operational until the new lighting fixtures, cables, etc. can be installed.

G-001-15.0 ACCEPTANCE TESTING. All acceptance testing of materials required by various sections of the specifications will be at no cost to the Contractor. However, the cost of any retesting required because the materials did not pass the acceptance tests, will be paid for by the Contractor.

G-001-16.0 COOPERATION BY THE CONTRACTOR. The Owner reserves the right to contract for and perform other or additional work on or near the work covered by this Contract.

When separate contracts are let within the limits of any one project, each Contractor shall conduct his/her work so as not to interfere with or hinder the progress of completion of the work being performed by other contractors.

The Contractor shall give constant attention to the work to facilitate the progress thereof, and he shall cooperate with the Engineer and his/her inspectors and with other contractors in every way possible. The Engineer shall allocate the work

and designate the sequence of construction in case of controversy between contractors. The Contractor shall have a competent superintendent on the work at all times who is fully authorized as his/her agent on the work. The superintendent shall be capable of reading and thoroughly understanding the plans and specifications and shall receive and fulfill instructions from the Engineer or his/her authorized representative.

Contractors working on the same project shall cooperate with each other as directed.

Each Contractor involved shall assume all liability, financial or otherwise, in connection with his/her contract and shall protect and save harmless the Owner from any and all damages or claims that may arise because of inconvenience, delays, or loss experienced by him because of the presence and operations of other Contractors working within the limits of the same project.

The Contractor shall arrange his/her work and shall place and dispose of the materials being used so as not to interfere with the operations of the other Contractors within the limits of the same project. He shall join his/her work with that of the others in an acceptable manner and shall perform it in proper sequence to that of the others.

G-001-17.0 METHOD OF MEASUREMENT No separate measurement of payment will be made for the provisions of facilities or the compliance with requirements under this section of these specifications, except as specified above. The provision of facilities and compliance with requirements covered by this section of these specifications shall be considered incidental to the various items of work specified hereinafter and all costs in connection with such provisions and compliance shall be included in the various unit and lump sum prices bid for the work items specified under other sections of these specifications.

END OF SECTION G-001

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G-002
RECORD DOCUMENTS

CONTRACT DOCUMENTS

This section of these specifications is a part of the Contract Documents as defined in the Contract Articles. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other sections.

Attention shall be directed to the sections of these specifications entitled, "Summary of Work and Special Work Requirements" and "Supplemental Contract Articles".

DESCRIPTION

G-002-1.1 GENERAL. The work included under this section of these specifications shall consist of preparing and submitting project record documents to the owner as specified here in.

ITEMS

G-002-2.1 AS-BUILT PLANS. The Contractor shall maintain at the site a set of drawings on which shall be recorded accurately as the work progresses the actual as-built dimensions and grades of all his/her work, indicating thereon all variations from the Contract Drawings. This record of as-built conditions shall include the work of all subcontractors. Notations on mechanical and electrical work shall include nameplate data for all installed equipment. The contractor shall keep these drawings current and available for review by the Engineer at all times.

Prior to final acceptance of the work, the Contractor shall have a final survey made by a Land Surveyor licensed in the State of New Hampshire. The final survey shall consist of taking cross sections at the same stations as the design cross sections with elevations recorded at every location where a proposed grade was shown on the design cross section, at all changes in grade, at the top and toes of slopes, and at the limits of work. The survey shall include the distance from the construction baseline or centerline of each elevation, measured horizontally to the nearest 0.1 foot. The as-built locations (station and offset from the construction baseline or centerline) and as-built rim and invert elevations of all drainage structures and pipes and electrical structures will be included in the survey. The elevation of all pavements and structures and pipes shall be measured to the nearest 0.01 foot and elevation in turf area shall be measured to the nearest 0.1 foot and shall be based upon the project benchmark.

All survey shall be referenced to the National Geodetic Survey (NGS) Primary Airport Control Station (PAC) and/OR Secondary Airport Control Station (SAC). PAC and SAC locations shall be obtained from <http://www.ngs.noaa.gov/cgi-bin/airports.pr1?TYPE=PACSAC>. Surveys shall be completed in AutoCAD®.

All as-built information from the final survey shall be shown on the As-Built Drawings. In addition, a copy of the survey information, prepared in a standard surveyor's format that can be easily followed and checked, will be provided.

The As-Built Drawings and the final survey information shall be submitted to the Engineer for review and shall be corrected by the Contractor as required. The As-Built Drawings and final survey shall be completed and accepted by the Engineer before the time when the final payment shall be due and payable. Electronic files shall be provided on CD. Hardcopies shall be mailed to the Engineer.

G-002-2.2 PROJECT PHOTOGRAPHS. The Contractor shall furnish photographs of the project, the views shall be as directed or approved by the Engineer. The photographs shall show the project site prior to construction, work in progress, and the project site at the completion of work. A minimum of 30 color photographs shall be taken during each 30-day period of the contract. Photographs shall be submitted to the owner at the completion of work. Digital photographs shall be submitted on a CD with the project name, number and dates clearly labeled on the CD and case.

G-002-2.3 AERIAL PHOTOGRAPHS.

1. The contractor shall furnish five (5) 24" x 36" color aerial photographs of the entire airport, including all airport boundaries. The photographs shall include Pembroke Road on the north, Airport Road on the west, Henniker Street on the east, and Manchester Street on the south. This photograph shall be taken directly over the airport encompassing the entire airfield and shall be taken at 300-scale.
2. Photographs are to be taken with a large format aerial camera with 12-inch focal length lens, utilizing a 9" x 9" negative.
3. Snow cover will not be permitted. Photos shall not be obscured by cloud cover. Photos shall be clear, in focus, with high resolution and sharpness. Color shall be correct; overly green or washed out photos will not be accepted. The Contractor shall submit to the Owner, contact prints of the photograph for approval prior to making enlargements. Prints shall indicate the approximate boundary of enlargements.
4. Final submission of enlargements, at the size selected by the owner, shall be mounted on rigid lightweight board (gaterboard) and shall be identified on the back. Photos shall be suitable for photogrammetric mapping.
5. Identification on the back of the print shall include
 - a. Name of photographer
 - b. Date
 - c. Scale of print
 - d. Compass direction at which the picture was taken.
 - e. AIP Project Number
6. *The Contractor shall also furnish digital images (TIF) of the aerial photo on a CD, as specified by the Owner*

G-002-2.4 FINAL DBE PARTICIPATION STATEMENT. The Contractor shall submit a statement showing the final accounting of all DBE participation actually used in the execution of the work prior to the final acceptance of the project. Should the actual DBE participation be less than the amount committed to in the Contractor's Goals and Assurance for Disadvantage Business Enterprise, than the Contractor shall provide written documentation of their good faith effort to achieve the goal per the requirements of the Concord Municipal Airport DBE Plan.

METHOD OF MEASUREMENT

G-002-3.1 As-Built Plans. All work and costs involved in furnishing a complete as-built plan set shall be measured as a single fixed lump sum item, which includes all labor, equipment, transportation, survey and all other incidentals associated with the production of accepted as-built documents.

G-002-3.2 Project Photographs. All work and costs involved in furnishing project photographs shall not be measured separately for payment, but rather shall be considered incidental the project items.

G-002-3.3 Aerial Photographs. All work and costs involved in furnishing aerial photographs shall be measured as a single fixed lump sum item, which includes all labor, equipment, transportation, survey and all other incidentals associated with the production of accepted photographs.

G-002-3.4 Final DBE Participation Statement. All work and costs involved in furnishing the final DBE Participation statement shall not be measured separately for payment, but rather shall be considered incidental the project items.

BASIS OF PAYMENT

002-4.1 As-Built Plans. Payment shall be made at the fixed lump sum price specified in the bid proposal for furnishing a complete as-built plan set, measured as specified above, which price and payment thereof shall constitute full compensation for all labor, materials, equipment, expenses, survey, and incidentals to provide the required as-built plan set accepted by the owner.

002-4.2 Aerial Photographs. Payment shall be made at the fixed lump sum price specified in the bid proposal for furnishing aerial photographs, measured as specified above, which price and payment thereof shall constitute full compensation for all labor, materials, equipment, expenses, and incidentals to provide the required aerial photographs accepted by the owner.

Payment shall be made under:

Item G-002-1	As-Built Plans	per Lump Sum
Item G-002-2	Aerial Photographs	per Lump Sum

END OF ITEM G-002

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ITEM M-001
MOBILIZATION, ENGINEER'S FIELD OFFICE,
AND SAFETY AND PHASING ITEMS

CONTRACT DOCUMENTS

001-0.1 This section of these specifications is a part of the Contract Documents as defined in the Contract Articles. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other sections.

Attention shall be directed to the sections of these specifications entitled, "Summary of Work and Special Work Requirements" and "Supplemental Contract Articles".

DESCRIPTION

001-1.1 The work included under this section of these specifications shall consist of mobilization for the base bid and each bid alternative; furnishing and maintaining the Engineer's Field Office and associated equipment; and providing construction barricades, traffic cones, runway closure markers, and taxiway closure markers.

EQUIPMENT AND MATERIALS

001-2.1 General. Equipment used in the performance of the work required by this section of the specifications shall be subject to the approval of the Engineer and maintained in a satisfactory working condition at all times.

001-2.2 Mobilization. Mobilization shall provide all materials, equipment and personnel necessary to complete the work not included in another pay item. Mobilization shall include the demobilization of all materials and equipment at the completion of the project.

Mobilization for the Add Alternates is included as a separate pay items. The project funding is anticipated to be provided in multiple parts. Therefore, it is anticipated that the base bid and/or one of the bid additive alternates may be completed before funding for the follow on bid alternates. The Contractor shall be prepared to remobilize for each Additive Alternate bid item.

001-2.3 Engineer's Field Office. The Contractor shall furnish and maintain during construction of the improvements contained in this Contract, a suitable field office for the Engineer at the site of the work. The field office, including all requirements of this specification, shall be available for use by the Engineer on the first day of work on the project, as stipulated in the Notice-to-Proceed. The field office shall remain on the site, for the Engineer's use, until the project has been approved and accepted during the project's final inspection. This shall include all awarded base bid and additive alternate work.

The office shall be equipped with electric lights, heating, air conditioning and telephone services. Drinking water shall be provided. The field office shall contain not less than 300 square feet of floor area and shall be equipped with locks for doors, and window shades for all windows. The office shall be equipped with the following furniture and equipment:

- | | | |
|---|---|---|
| 1 | - | standard-size, flat top desk |
| 1 | - | drafting table at least 2 feet 8 inches wide and 6 feet long |
| 2 | - | chairs (1 desk chair) |
| 1 | - | internet connection for computer (4G USB Modem) capable of establishing an internet connection from any location on the job site. |
| 1 | - | portable, hand-held, two-way, air band transceiver with quick recharge (2 batteries) |
| 1 | - | four-drawer steel file cabinet |
| 1 | - | small, office-type refrigerator |
| 1 | - | laser auto-level, graduated level rod and receiver with recent calibration certificate by a certified technician |

The Contractor shall provide sanitary facilities in the vicinity of the Engineer's Field Office. The location of such facilities shall be approved by the Engineer.

The location of the field office shall be approved by the Engineer. The Contractor shall maintain the office during construction and remove it upon completion of the work.

The Contractor shall pay all telephone (including long distance), internet, heating and electric bills applicable to the Contract.

The Contractor shall furnish assistance to the Engineer, as requested, to check the layout or otherwise control the work. Such assistance shall be understood to include the provision of suitable manpower to assist the Engineer in taping measurements, holding a survey rod, checking grades and the like. The Contractor's obligations for furnishing assistance to the Engineer shall be deemed incidental to the completion of the various work items and no separate payment shall be made for such assistance.

001-2.4 Construction Barricades, Lights and Flags. The contractor shall provide sufficient barricades, complete with lights and flags, for the completion of work in accordance with the safety and phasing plans. The contractor shall be responsible for setting up, maintaining, moving and removing the barricades at the completion of the each phase of construction. Refer to Contract drawings for barricade requirements/specifications. It shall be the contractor's responsibility to determine the number of barricades, lights and flags required based on their schedule and progress of work.

During the course of the project, the Contractor shall be responsible for maintaining the barricades, lights and flags. Should any lights or flags malfunction during the project, the Contractor shall be responsible for replacing the lights and flags within 24 hours.

Prior to ordering the barricades, lights and flags the contractor shall submit shop drawings for the materials to be purchased to the engineer for approval. The shop drawings shall include a manufacturer's certification that each product meets the requirements of FAA AC150/5370-2F.

001-2.5 Traffic Cones. The contractor shall provide sufficient traffic cones for the completion of work in accordance with the safety and phasing plans. The contractor shall be responsible for setting up, maintaining, moving and removing the cones at the completion of each phase of construction. Refer to Contract drawing for traffic cone requirements. It shall be the contractor's responsibility to determine the number of cones required based on their schedule and progress of work.

During the course of the project, the Contractor shall be responsible for maintaining the cones. Should any cones become dislodged or overturned during the project, the Contractor shall be responsible for repositioning them immediately.

Prior to ordering the cones the contractor shall submit shop drawings for the materials to be purchased to the engineer for approval.

001-2.6 Runway Closure Markers. The contractor shall provide six (6) runway closure markers for the completion of work in accordance with the safety and phasing plans. The contractor shall be responsible for setting up, maintaining, moving and removing the markers at the completion of the each phase of construction. Refer to Contract drawings for runway closure marker requirements.

During the course of the project, the Contractor shall be responsible for maintaining the runway closure markers. Should any markers become dislodged, overturned, or damaged during the project, the Contractor shall be responsible for repairing them immediately. The contractor may also be required to temporarily remove/replace the markers at pre determined instances to allow the passage of aircraft.

Prior to ordering the runway closure markers the contractor shall submit shop drawings for the materials to be purchased to the engineer for approval. The shop drawings shall include a manufacturer's certification that each

product meets the requirements of FAA AC150/5370-2F.

001-2.7 Taxiway Closure Markers. The contractor shall provide sufficient taxiway closure markers for the completion of work in accordance with the safety and phasing plans. The contractor shall be responsible for setting up, maintaining, moving and removing the markers at the completion of the each phase of construction. Refer to Contract drawings for taxiway closure marker requirements. It shall be the contractor's responsibility to determine the number of barricades, lights and flags required based on their schedule and progress of work.

During the course of the project, the Contractor shall be responsible for maintaining the taxiway closure markers. Should any markers become dislodged or damaged during the project, the Contractor shall be responsible for repairing them immediately.

Prior to ordering the taxiway closure markers the contractor shall submit shop drawings for the materials to be purchased to the engineer for approval. The shop drawings shall include a manufacturer's certification that each product meets the requirements of FAA AC150/5370-2F.

001-2.9 Flagpersons, Gate Guards and Escorts. The Contractor shall provide flagpersons or escorts at each active runway, taxiway, taxilane, and apron pavement being crossed by his/her equipment to assure that moving aircraft are given the right-of-way at all times. Flagpersons shall also be required when vehicles on a service road are crossing the approach to an active runway in addition to previously specified radio vehicles. The flagpersons and escorts shall be carefully selected and fully instructed as to their duties in regulating the Contractor's equipment crossing the aircraft pavement. They shall also be provided with broom, shovel and brush and instructed to remove any debris that might be left by the equipment on the aircraft pavement where it might be ingested by an aircraft engine. Each flagperson shall be provided with and shall wear at all times he/she is directing traffic, an approved striped vest of a type specifically designed for use by traffic control personnel.

The contractor shall provide a gate guard during all working hours at contractor access gates as shown on the contract drawings. The gate guard shall not allow any non-construction personnel access to the airfield.

The Contractor shall also provide flagpersons or uniformed officers at locations where the haul routes enter public streets or highways from airport property in accordance with the applicable local requirements. No additional payment shall be made for flagpersons or uniformed offices but rather each shall be considered incidental to the overall project.

001-2.10 Radio Control. The Contractor shall have two-way radio communication between radio control vehicle and his field office, superintendent's vehicle, flagpersons, escort vehicles, gate guards and the resident engineer. No FAA or other airport frequency will be used for this purpose. These radios shall be purchased, installed, maintained and operated at the Contractors expense. The engineer may at his/her discretion approve the use of cell phones in lieu of the two-way radios.

The Contractor shall have on-site at all times at least one (1) radio-equipped vehicle with operator who shall monitor the radio during all working hours. The radio vehicle shall have a two-way radio on the Unicom frequency of 122.7 MHZ and the radio shall be capable of reliable two-way communication from any location on the airport.

The Contractor shall, before the start of construction, test his/her radio with the appropriate agencies to demonstrate the capabilities and to demonstrate the performance of the operator and the equipment. The radio vehicle shall have a rotating amber light on the roof, which shall be in operation at all times. The radio car will be parked in an appropriate location so that the operator can view the work. Radio control will be required whenever the Contractor is working in or adjacent to the aircraft operations areas.

Radio control and flagpersons or escorts will be required whenever the Contractors vehicle and equipment are on or crossing active runways, taxiways, taxilanes or aprons.

The Contractor shall furnish and maintain hand-held air band transceivers for use on the airport during construction.

The air band transceivers will be used by the Contractor and the resident engineer, one each, to communicate with air traffic on the Unicom frequency of 122.7 MHZ.

METHOD OF MEASUREMENT

001-3.1 Mobilization – Base Bid. All work and costs involved in mobilizing shall be measured as a lump sum.

001-3.2 Mobilization – Alternates #1 through 2. All work and costs involved in mobilizing shall be measured as a lump sum.

001-3.3 Engineers Field Office. All work and costs involved in furnishing and maintaining the Engineer's field office shall be measured as a single lump sum item including all labor, equipment, site preparation, utility hookups, utility bills and all incidentals.

001-3.4 Safety and Phasing Items. Safety and Phasing items shall include construction barricades, lights and flags; traffic cones; construction signage; runway closure markers; taxiway closure markers; covering existing guidance signs; disabling runway/taxiway lights during closures; and escorts, flag persons, radios, and gate guards. These items shall be measured as a lump sum.

Assembly, transport, placement, repositioning, maintaining, disassembly and removal of all safety and phasing items shall not be measured separately but rather shall be considered incidental to the item.

BASIS OF PAYMENT

001-4.1 Mobilization – Base Bid. Payment shall be made at the contract unit price, which price and payment thereof shall constitute full compensation for all labor, materials, equipment, expenses and incidentals required. Payment shall be made in three parts: the first payment equal to 50% of the total bid price for mobilization of the awarded contract shall be made after the Contractor has completed 25% of the anticipated work, based upon the overall contract amount. The second payment equal to 25% of the total bid price for mobilization of the awarded contract shall be made upon completion of one-half of the anticipated work, based upon the overall contract amount. The final payment of 25% of the total bid price for mobilization shall be made upon completion and acceptance of the work.

001-4.2 Mobilization – Alternates #1 and 2. Payment shall be made at the contract unit price, which price and payment thereof shall constitute full compensation for all labor, materials, equipment, expenses and incidentals required. Payment shall be made in three parts: the first payment equal to 50% of the total bid price for mobilization of the awarded contract shall be made after the Contractor has completed 25% of the anticipated work, based upon the overall contract amount. The second payment equal to 25% of the total bid price for mobilization of the awarded contract shall be made upon completion of one-half of the anticipated work, based upon the overall contract amount. The final payment of 25% of the total bid price for mobilization shall be made upon completion and acceptance of the work.

001-4.3 Engineer's Field Office- Base Bid. Payment shall be made at the contract unit price for the furnishing and maintaining of the Engineer's Field Office, measured as specified above, which price and payment thereof shall constitute full compensation for all labor, materials, equipment, expenses and incidentals for providing the Field Office. Payment shall be made in two parts: the first payment equal to 50% of the total bid price of the awarded contract shall be made after the Contractor has supplied the item and it has been approved by the Engineer as meeting the specification. The second payment equal to 50% of the total bid price of the awarded contract shall be made upon completion and acceptance of the work. There shall be separate payment for the base bid and each bid alternate if awarded.

001-4.4 Safety and Phasing Items. Payment shall be made at the lump sum price specified in the bid proposal for furnishing the safety and phasing items. The first payment equal to 60% of the bid price for Safety and Phasing Items shall be made after the Contractor has set up the items for the subject base bid or additive alternate. The final payment equal to 40% of the bid price shall be made upon completion of and acceptance of the work for the subject base bid or additive alternate.

Payment shall be made under:

Item M-001-1	Mobilization – Base Bid	per Lump Sum
Item M-001-2	Mobilization – Alternate #1	per Lump Sum
Item M-001-3	Mobilization – Alternate #2	per Lump Sum
Item M-001-4	Engineer’s Field Office – Base Bid	per Lump Sum
Item M-001-5	Engineer’s Field Office – Alternate #1	per Lump Sum
Item M-001-6	Engineer’s Field Office – Alternate #2	per Lump Sum
Item M-001-7	Safety and Phasing Items – Base Bid	per Lump Sum
Item M-001-8	Safety and Phasing Items – Alternate #1	per Lump Sum
Item M-001-9	Safety and Phasing Items – Alternate #2	per Lump Sum

END OF ITEM M-001

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ITEM M-002
CONTRACTOR'S SAFETY PLAN COMPLIANCE DOCUMENT

CONTRACT DOCUMENTS

002-0.1 This section of these specifications is a part of the Contract Documents as defined in the Contract Articles. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other sections.

Attention shall be directed to the sections of these specifications entitled, "Summary of Work and Special Work Requirements" and "Supplemental Contract Articles".

DESCRIPTION

002-1.1 The work included under this section of these specifications shall consist of preparing and submitting for approval a Safety Plan Compliance Document (SPCD) as required by FAA AC 150/5370-2F.

EXECUTION

002-2.1 General. The contractor shall review, in detail, the Construction Safety and Phasing Plan (CSPP) prepared by the airport and engineer. Once the contractor has read and fully understands the CSPP, they shall prepare a Safety Plan Compliance Document (SPCD) which details how the contractor will comply with the CSPP.

002-2.2 Contractor's Safety Plan Compliance Document (SPCD). The Contractor shall prepare a Safety Plan Compliance Document (SPCD) in accordance with AC 150/5370-2F, *Operational Safety on Airports During Construction*. Similar to a shop drawing the SPCD, including all requirements of this specification, shall be submitted to the Engineer for review prior to the Pre-Construction Meeting. The SPCD must be reviewed and approved by the airport prior to issuance of the notice-to-proceed.

The Contractor shall designate an individual as the Site Safety officer (SSO). The SSO may be the Contractor's Site Superintendent who is responsible for day to day operations on the site. The SSO shall be on site daily and work on a daily basis to implement and enforce the CSPP and SPCD. The SSO shall conduct daily inspections. Among other items, the daily inspections shall include inspection of the barricades, lights, flags, traffic cones, closure markers and protection of the taxiway/runway safety and object free areas. When necessary, the SSO will work with the engineer and airport on Safety related items such as coordinating NOTAMS, covering signs, and disabling lights on closed taxiways.

At a minimum, the SPCD shall include the items listed in Section 204.b.(1) through (18) of FAA AC 150/5370-2F to include but not be limited to the following:

- Designate a Site Safety Officer and provide the SSO's contact information
- Contractor's points of contact, including 24-hr emergency point of contact
- Engineer's contact information
- Airport contact information
- a list of radio escorts
- details of contractor escorting procedures
- list of all equipment to be used
- maximum height of all equipment to be used
- acknowledgement of height restrictions on airport construction
- typical daily work hours
- FOD management procedures (inspections, equipment to be used and methods for cleanup)
- Stormwater management methods to prevent migration of FOD (silt) onto adjacent pavements
- Material stockpile locations and limitations
- identify potential hazards
- methods for marking and lighting hazards
- A certification statement acknowledging receipt of the CSPP (include CSPP approval date)

- A certification statement by the contractor that indicates they understand the operational safety requirements of the CSPP and they assert they will not deviate from the approved CSPP and SPCD unless written approval is granted by the airport.

METHOD OF MEASUREMENT

002-3.1 Contractor's Safety Plan Compliance Document. All work and costs involved in furnishing a complete SPCD shall not be measured separately for payment, but shall be measured as a single item including all labor and incidentals.

BASIS OF PAYMENT

002-4.1 Contractor's Safety Plan Compliance Document. Payment shall be made at the contract unit price for furnishing and implementing the SPCD, measured as specified above, which price and payment thereof shall constitute full compensation for all labor, preparation, materials, equipment, expenses and incidentals. Payment shall be made after review and upon acceptance of the document by the airport.

Payment shall be made under:

Item M-002-1	Contractor's Safety Plan Compliance Document (SPCD)	per Lump Sum
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END OF ITEM M-002 AFTER CSPP

ITEM M-003
SAWED CONTROL JOINTS

CONTRACT DOCUMENTS

003-0.1 This section of these specifications is a part of the Contract Documents as defined in the Contract Articles. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other sections.

Attention shall be directed to the sections of these specifications entitled, "Summary of Work and Special Work Requirements" and "Supplemental Contract Articles".

DESCRIPTION

003-1.1 The work included under this section of these specifications shall consist of furnishing all labor, equipment and materials necessary to perform all operations in connection with sawing of control joints in new bituminous concrete pavement.

All work will be done in strict conformance with these specifications and the details shown on the Contract Drawings.

MATERIALS

003-2.1 Sealant material shall conform to the specifications listed under section P-605 of the technical specifications.

CONSTRUCTION METHODS

003-3.1 Pavement Joints.

Control joints shall be sawed as shown on the Contract Drawings or as directed by the Engineer.

Sawed control joints in new bituminous pavement shall be constructed where pavement sections change or vary. (i.e. where pavement thickness changes or where base or sub base course depths vary. Joints shall be constructed within ½-inch of the horizontal alignment of the change in pavement sections.

Sawed control joints shall be constructed where new bituminous pavement meets existing pavement and where new pavement was required to be cut back. (i.e.- between days production) Sawed Joints shall be constructed on the paving joint.

The new pavement shall have aged sufficiently to allow a clean cut to be made and to withstand eroding effects of the saw or other cutting device.

003-3.2 Workmanship. All workmanship shall be of the highest quality. Any workmanship determined to be below the high standards of the particular craft involved will not be accepted, and will be corrected and/or replaced as required by the Engineer.

The Engineer will inspect the sawed control joints and require replacement or repairs if joints are not constructed to the specifications.

METHOD OF MEASUREMENT

003-4.1 The quantity of sawed control joints to be paid for shall be the number of linear feet of saw cut control joints constructed, completed and accepted as satisfactory.

BASIS OF PAYMENT

003-5.1 Payment shall be made at the contract unit price per linear foot of saw cut control joints, measured as specified above, complete and accepted, which price and the payment thereof shall constitute full compensation for all labor, materials, sealant, equipment, expenses and incidentals necessary to complete the saw cut of control joints.

Payment shall be made under:

Item M-003-1	Sawed Control Joint	per Linear Foot
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MATERIAL REQUIREMENTS

ASTM D4561	Standard Practice for Quality Control Systems for Organizations Producing and Applying Bituminous Paving Materials
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END OF ITEM M-003

ITEM M-004
PAVEMENT MILLING

CONTRACT DOCUMENTS

004-0.1 This section of these specifications is a part of the Contract Documents as defined in the Contract Articles. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other sections.

Attention shall be directed to the sections of these specifications entitled, "Summary of Work and Special Work Requirements" and "Supplemental Contract Articles".

DESCRIPTION

004-1.1 The work included under this section of these specifications shall consist of the removal of existing bituminous concrete or Portland Cement Concrete pavements to the depth and grade as shown on the plans or as directed by the Engineer. Where new pavement is to meet existing pavement, the surface of the existing pavement shall be cut to a depth as necessary to provide for the placing of a bituminous concrete overlay. The resulting planed surface shall be free from gouges, ridges, oil film, dust or any other foreign matter and shall have a uniform surface appearance.

EQUIPMENT

004-2.1 Equipment used in the performance of the work required by this section of the specifications shall be subject to the approval of the Engineer and maintained in a satisfactory working condition at all times.

The equipment used for milling the pavement surface shall be capable of removing the existing pavements to the depth shown on the plans and as directed by the Engineer. The equipment shall be self-propelled with sufficient power, traction and stability to maintain an accurate depth of cut and slope. The equipment shall be capable of accurately and automatically establishing grade line along each edge of the machine by referencing from the existing pavement or from an independent grade control (string line or GPS) within a tolerance of $\pm 1/2$ of an inch (3.2 mm).

The equipment shall either be equipped with an integral loading and reclaiming means to immediately remove material being cut and discharge it into a truck, or the Contractor shall supply other equipment (power brooms, loaders, etc.) as necessary to clean up the material as soon as it has been cut.

All material generated by the milling operation shall be legally disposed of offsite by the contractor.

The Contractor shall also apply all necessary auxiliary milling machinery and hand labor as may be necessary to remove pavement around any existing structures (e.g., catch basins, manholes, and light bases).

CONSTRUCTION METHODS

004-3.1 General. The Contractor shall be responsible for laying out the limits of the milling as approved by the Engineer prior to starting the actual cutting. The Contractor shall remove the existing surface material in such a manner as to leave a neat, straight, vertical cut between the finished surface of the proposed overlay and the pavement to remain, as approved by the Engineer. If the Contractor's equipment is unable to leave a neat, straight, vertical face, as determined by the Engineer, the Contractor shall be required to saw cut such a neat, straight, vertical line before proceeding with the milling. No additional payment will be made if saw cutting is necessary.

Within the areas indicated on the plans, the Contractor shall mill to meet the design grades and elevations shown on the plans. It is the Contractor's responsibility to determine the actual depth of milling required to properly construct the overlay to the finish grades and elevations indicated on the plans. In addition, the engineer may direct the contractor to adjust milling depths (up to $1/2$ ") to avoid thin delaminated layers of existing pavement.

The Contractor shall protect the cut edges of the pavement from damage and edge breakdown resulting from the construction operations. Any edge breakdown resulting from the Contractor's operations shall be refurbished by the Contractor to the complete satisfaction of the Engineer.

The material generated by the milling operation shall become the property of the Contractor. The Contractor shall be required to collect, transport, and legally dispose of the millings off of airport property.

Should the required thickness of the new bituminous pavement overlay not meet the thickness tolerance of the P-401 Bituminous pavement, the Contractor shall correct the deficiency prior to paving; either by milling additional material or by applying a bituminous concrete leveling course as need in areas of over milling. Corrective measures required due to contractor error, such as over/under milling, shall not paid for. This shall not apply to areas where the Engineer directs the Contractor to adjust milling depths for the purpose of eliminating thin delaminated layers.

004-3.2 - Clean-Up and Dust Control. The Contractor shall be responsible for promptly cleaning up all debris resultant of the milling operations. Debris shall not be allowed to remain on the runway, taxiway or apron where it could be ingested into aircraft engines. The Contractor shall have on-site and in working order at all times all equipment which may be needed to keep the pavement clean to the complete satisfaction of the Engineer. Such equipment may include, but not necessarily be limited to, power brooms, loaders, vacuum sweepers and water trucks for flushing the surface.

The Contractor shall control the dust produced from the milling and cleaning operations from escaping into the air.

METHOD OF MEASUREMENT

004-4.1 The quantity of milling to be paid for shall be the actual number of square yards of portland cement concrete and/or bituminous concrete surface area milled. The depth of milling will vary, as indicated on the plans, to achieve the final design grades. The quantity of milling shall include removal and off site disposal, clean-up, saw cutting if necessary. All areas milled beyond the necessary limits shall not be measured for payment; rather they shall be renovated at the Contractor's expense.

BASIS OF PAYMENT

004-5.1 Payment shall be made at the contract unit price per square yard of milling (at varying depths), measured as specified above, complete and accepted, which price and the payment thereof shall constitute full compensation for all labor, material, equipment, hauling, clean up, expenses and incidentals necessary to complete the milling.

Payment shall be made under:

Item M-004-1	Pavement Milling	per Square Yard
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END OF ITEM M-004

ITEM M-005

LUPINE TRANSPLANTING

CONTRACT DOCUMENTS

005-0.1 This section of these specifications is a part of the Contract Documents as defined in the Contract Articles. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other sections.

Attention shall be directed to the sections of these specifications entitled, "Summary of Work and Special Work Requirements" and "Supplemental Contract Articles".

DESCRIPTION

005-1.1 This item shall consist of removing existing wild blue lupine plants and replanting at the location(s) shown on the plans. Lupine plants are located in the wildlife conservation zone located at Concord Municipal Airport which is managed by the New Hampshire Fish and Game Department.

Included in this item is preparation of the planting area(s), excavation, backfill, disposal of surplus and unsuitable excavated material; removal of existing lupine plants, transport, and replanting including soil backfill and topdressing; watering and maintaining until plants are established.

It is assumed that all blue lupine will be transplanted at the beginning of the first phase of construction.

EQUIPMENT

005-2.1 Equipment. Equipment used in the performance of the work required by this section of the specifications shall be subject to the approval of the Engineer, the New Hampshire Fish and Game Department, and maintained in a satisfactory working condition at all times.

The equipment used for removing the existing established lupine plants shall be a tree spade of sufficient size to remove a root ball of at least:

48-inches in diameter
40-inches in depth

The equipment shall be of sufficient size, power, and stability that it can readily cut in to the existing sandy soils and create a root ball of the specified size without adversely affecting the lupine plant.

The Contractor shall also apply all necessary auxiliary trucks, excavators, other equipment, and manpower as may be necessary for preparation, removal, transporting, replanting, restoration, cleanup and removal of spoils.

SUBMITTALS

005-3.1 Equipment Information. The contractor shall submit pertinent information on the equipment to be used to perform the work. Information shall include model numbers, capabilities and capacities. Submitted information shall allow the Engineer and New Hampshire Fish and Game Department to confirm the equipment meets the requirements of this specification.

005-3.2 Schedule and Work Plan. A schedule and work plan covering the preparation of the transplant area, removal procedure, transporting procedure, relocation, replanting, restoration, cleanup, and maintenance shall be submitted to the engineer for approval. The work plan shall consider the time of year for the transplanting and set a schedule for the application of water to the transplanted areas.

QUALITY ASSURANCE

005-4.1 Contractor's Personnel. The Contractor shall employ or hire subcontractors or consultants who are routinely involved in the planting and transplanting of landscape to oversee the work.

005-4.2 Existing Conditions. Existing blue lupine plants which are to be relocated are shown in the contract drawings. All plants are on Concord Municipal airport and are in the designated work areas for the Taxiway construction work. Exact plants to be relocated will be selected and marked by the New Hampshire Fish and Game Department in the field prior to beginning work.

The contractor shall not remove existing lupine plants if the conditions are not favorable. (i.e. too wet, too dry, etc.)

The contractor may, at his or her discretion, add water to the existing lupine plants prior to removal in order to aid in holding the existing sandy soil root ball together.

005-4.3 Inspection. Engineer and/or the New Hampshire Fish and Game Department will observe the transplanting process.

005-4.4 Special Project Warranty. Should existing lupine plants fail to survive after transplanting, the area which the plants are transplanted to shall be prepared and seeded in accordance with specifications T-901 and T-905 for Conservation Habitat Areas.

MATERIALS

005-5.1 General. Plants shall be installed in the existing soil and backfilled with selected material from the project area excavation. Should additional soil be required, it shall be obtained from within the limits of the taxiway construction work area(s). Lupine removed from Phase 2 or 3 work areas shall be backfilled with existing topsoil and seeded with Conservation Habitat Seed as these areas will not be constructed immediately.

CONSTRUCTION METHODS

005-6.1 General. Timing: Lupine plants shall be relocated before any other construction equipment is mobilized to the work area(s). The contractor shall notify the Engineer at least 14-days prior to beginning work so that they can coordinate field marking of the plants to be relocated.

005-6.2 Preparation of Transplant Area.

- A. Planting pits: Excavate pits in accordance with the planting details. Pits shall be of the proper dimensions to accept the root ball as generated by the tree spade. Pits shall be spaced as directed or as shown on the contract drawings
- B. Retain excess subsoil removed from excavations for use elsewhere in the project.

005-6.3 Transplanting.

- A. Transplanting shall be done in accordance with typical planting details in the contract drawings. Removal, transporting, planting, and backfilling shall be in accordance with the contractor's approved work plan.
- B. Watering: Thoroughly water all plants immediately after replanting. This shall mean full and thorough saturation of all backfill in the pits and beds during the same day of planting. Apply water only by open end hose of sprinklers at a very low pressure to avoid air pockets and damage to the roots.

005-6.4 Final Clean Up and Restoration

- A. Removal areas. All removal areas which will not immediately be constructed shall be backfilled with existing soil to an elevation even with the surrounding grade and seeded with conservation habitat seed.
- B. Transplant Area. The transplant area shall be top-dressed as required to create a near level, smooth area(s) which can be easily maintained and mowed.
- C. All spoils shall be cleaned up and either removed or used elsewhere on the project.
- D. Maintenance shall begin immediately after each plant is planted. Plants shall be watered, and protected until provisional acceptance. Defective work shall be corrected as soon as possible after defects become apparent, and weather and season permit.

005-6.5 Maintenance. The contractor shall be responsible for maintaining the transplanted lupine plants until they are established. Maintenance shall include watering at intervals as required to ensure the transplanted plants thrive.

METHOD OF MEASUREMENT

005-7.1 The quantity of transplanted blue lupine to be paid for shall be the number of square feet of plants transplanted complete including preparation, excavation, replanting, backfilling, topdressing, seeding of removal areas and all work necessary to plant, maintain, and guarantee the transplanted lupine.

Topsoil and seed for backfilling removal areas or for replanting failed transplants (if applicable) shall not be paid for separately but shall be considered incidental to the transplanting item.

BASIS OF PAYMENT

005-8.1 Payment for transplanting blue lupine will be made at the contract unit price per square foot. This price shall be full compensation for furnishing all materials, equipment, manpower and for all preparation, excavation, removal, backfilling, topdressing and installing of the plant materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

M-005-1	Transplant Blue Lupine	per square foot
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END OF ITEM M-005

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ITEM M-006
PIPE AND STRUCTURE CLEANING

CONTRACT DOCUMENTS

006-0.1 This section of these specifications is a part of the Contract Documents as defined in the Contract Articles. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other sections.

Attention shall be directed to the sections of these specifications entitled, "Summary of Work and Special Work Requirements" and "Supplemental Contract Articles".

DESCRIPTION

006-1.1 This item consists of cleaning existing electrical structures and conduit as shown in the contract drawings or as directed by the Engineer.

EQUIPMENT

006-2.1 The equipment used shall be of current technological standards for pipe and structure cleaning. The Engineer shall approve the equipment prior to commencement of the work. The workmen conducting the work shall have a minimum of 3-years experience in the work.

CONSTRUCTION METHODS

006-3.1 Existing electrical structures shall be thoroughly cleaned. See contract drawings for locations. All sand, sediment and other debris shall be collected and disposed of offsite. The contractor shall use extreme care not to damage the existing conductors.

Prior to installing new conductors, the existing conduits (ducts) shall be thoroughly cleaned. See contract drawings for locations. All sand, sediment and other debris shall be collected and disposed of offsite.

During cleaning of the existing structures and conduits the contractor shall conduct their work with care so as not to allow debris to infiltrate into existing conduits which will not be cleaned.

METHOD OF MEASUREMENT

006-4.1 Clean Existing Structure. Each structure cleaned shall be measured per each.

006-4.2 Clean Existing Conduit. The length of existing conduit (duct) cleaned shall be measured per linear foot. It shall be measured along the centerline of the conduit from inside face of structure to inside face of structure.

BASIS OF PAYMENT

006-5.1 Clean Existing Structure. Payment shall be made at the contract unit price per each structure cleaned and accepted. This price shall be full compensation for furnishing all materials and for all preparation, execution; and for all labor equipment, tools and incidentals necessary to complete the cleaning.

006-5.2 Payment shall be made at the contract unit price per linear foot for each length of conduit cleaned and accepted. This price shall be full compensation for furnishing all materials, for preparation, execution; and for all labor, equipment tools, and incidentals necessary to complete the item.

Payment will be made under:

Item M-006-1	Clean Existing Structure	per each
Item M-006-2	Clean Existing Conduit	per linear foot

END OF ITEM M-006

ITEM P-151
CLEARING AND GRUBBING

CONTRACT DOCUMENTS

151-0.1 This section of these specifications is a part of the Contract Documents as defined in the Contract Articles. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other sections.

Attention shall be directed to the sections of these specifications entitled, "Summary of Work and Special Work Requirements" and "Supplemental Contract Articles".

DESCRIPTION

151-1.1 This item shall consist of clearing or clearing and grubbing, including the offsite disposal of materials, for all areas within the limits designated on the plans or as directed by the Engineer.

Clearing shall consist of the cutting and removal of all trees, stumps, brush, logs, hedges, and other loose or projecting material from the designated areas. The grubbing of stumps and roots will not be required.

Clearing, when so designated, shall consist of the cutting and removal of isolated single trees or isolated groups of trees. The cutting of all the trees of this classification shall be in accordance with the requirements for the particular area being cleared, or as shown on the plans, or as directed by the Engineer. The trees shall be considered isolated when they are 40 feet or more apart, with the exception of a small clump of approximately five trees or less.

Clearing and grubbing shall consist of clearing the surface of the ground of the designated areas of all trees, stumps, down timber, logs, snags, brush, undergrowth, hedges, heavy growth of grass or weeds, structures, debris, and rubbish of any nature, natural obstructions or such material which in the opinion of the Engineer is unsuitable for the foundation of strips, pavements, or other required structures, including the grubbing of stumps, roots, matted roots, foundations, and the offsite disposal from the project of all spoil materials resulting from clearing and grubbing.

CONSTRUCTION METHODS

151-2.1 GENERAL. The areas denoted on the plans to be cleared or cleared and grubbed shall be staked on the ground by the Contractor. The clearing and grubbing shall be done at a satisfactory distance in advance of the grading operations.

All spoil materials removed by clearing or by clearing and grubbing shall become the property of the contractor and shall be legally disposed off-site.

The removal of existing structures and utilities required to permit orderly progress of work shall be accomplished by local agencies, unless otherwise shown on the plans. Whenever a telephone or telegraph pole, pipeline, conduit, sewer, roadway, or other utility is encountered and must be removed or relocated, the Contractor shall advise the Engineer who will notify the proper local authority or owner and attempt to secure prompt action.

151-2.2 CLEARING. The Contractor shall clear the staked or indicated area of all objectionable materials. Trees unavoidably falling outside the specified limits must be cut up, removed, and disposed of in a satisfactory manner. In order to minimize damage to trees that are to be left standing, trees shall be felled toward the center of area being cleared. The Contractor shall preserve and protect from injury all trees not to be removed. The trees, stumps, and brush shall be cut to a height of not more than 12 inches above the ground. The grubbing of stumps and roots will not be required.

When isolated trees are designated for clearing, the trees shall be classed in accordance with the butt diameter size as measured at a point 4-feet above the average ground level.

151-2.3 CLEARING AND GRUBBING. In areas designated to be cleared and grubbed, all stumps, roots, buried logs, brush, grass, and other unsatisfactory materials shall be removed, Tap roots and other projections over 1 ½

inches in diameter shall be grubbed out to a depth of at least 18 inches below the finished subgrade or slope elevation.

All holes remaining after the grubbing operation in embankment areas shall have the sides broken down to flatten out the slopes, and shall be filled with acceptable material, moistened and properly compacted in layers to the density required in Item P-152. The same construction procedure shall be applied to all holes remaining after grubbing in excavation areas where the depth of holes exceeds the depth of the proposed excavation.

METHOD OF MEASUREMENT

151-3.1 The quantities of clearing or clearing and grubbing as shown by the limits on the plans or as ordered by the Engineer shall be the number of acres or fractions thereof, of land specifically cleared or cleared and grubbed.

When isolated trees are designated for clearing, the quantities of trees, as determined in accordance with ranges of butt diameter size, measured at a point 4-feet above the average ground level at the tree, shall be paid for according to the schedule of sizes as follows:

The number of trees:

From 0 to 24-inch, butt diameter

Isolated trees to be removed and paid per each are individually called out on the plans.

BASIS OF PAYMENT

151-4.1 Payment shall be made at the contract unit price per acre for clearing. This price shall be full compensation for removing and disposing of all debris, for furnishing all materials and for all labor, equipment, tools, and incidentals necessary to complete the item.

151-4.2 Payment shall be made at the contract unit price for clearing isolated trees. This price shall be full compensation for removing and disposing of all debris, for furnishing all materials and for all labor, equipment, tools, and incidentals necessary to complete the item.

151-4.3 Payment shall be made at the contract unit price per acre for clearing and grubbing. This price shall be full compensation for removing and disposing of all debris, for furnishing all materials and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-151-1	Clearing, On Airport	per acre
Item P-151-2	Clearing, Off Airport	per acre
Item P-151-3	Clearing and Grubbing	per acre
Item P-151-4	Select Tree Clearing: 0-24" diameter	per each

END OF ITEM P-151

ITEM P- 152
EXCAVATION AND EMBANKMENT

CONTRACT DOCUMENTS

152-0.1 This section of these specifications is a part of the Contract Documents as defined in the Contract Articles. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other sections.

Attention shall be directed to the sections of these specifications entitled, "Summary of Work and Special Work Requirements" and "Supplemental Contract Articles".

DESCRIPTION

152-1.1 This item covers excavation, removal, disposal, placement, and compaction of all materials within the limits of the work required to construct safety areas, runways, taxiways, aprons, and intermediate as well as other areas for drainage, building construction, parking, or other purposes in accordance with these specifications and in conformity to the dimensions and typical section(s) shown on the plans.

152-1.2 CLASSIFICATION. All material excavated or removed shall be classified as defined below:

a. Unclassified Excavation. Unclassified excavation shall consist of the excavation and disposal of all material, regardless of its nature, which is not otherwise classified and paid for under the following items.

b. Structure Removal. The removal of the existing drainage or electrical structures shall consist of all work, incidentals, excavation, removal and legal disposal of structures and associated pipes of inert or hazardous material as called for on the plans or as directed by the engineer.

c. Drainage Pipe Removal. The removal of the existing drainage pipe, regardless of the diameter size or bedding, shall consist of all work, incidentals, excavation, removal and legal disposal of pipe, regardless of inert or hazardous material, as called for on the plans or as directed by the engineer.

d. Headwall Removal. The removal of the existing concrete headwall shall consist of all work, incidentals, excavation, removal and legal disposal of concrete, inert or hazardous material as called for on the plans or as directed by the engineer.

e. Elevated Light Removal. Elevated light removal shall consist of the removal and disposal off airport property of elevated taxiway/runway lights, transformers, and all other items associated with and airfield light as called for on the plans.

f. Guidance Sign Removal. Guidance Sign removal shall consist of the removal and disposal off airport property of guidance signs, transformers, concrete foundations, and junction cans as called for on the plans including all excavation and backfilling necessary to complete the item and restore the area in a manner acceptable to the Engineer.

g. Direct Buried Cable Removal. Cable removal shall consist of the removal and disposal off airport property of cable as called for on the plans including all excavation and backfilling necessary to complete the item and restore the area in a manner acceptable to the Engineer.

h. Concrete Encased Duct Bank Removal. Duct Bank removal shall consist of the removal and disposal off airport property of concrete encased duct banks called for on the plans including all excavation and backfilling necessary to complete the item and restore the area in a manner acceptable to the Engineer.

i. Conduit Removal. Conduit removal shall consist of the removal and disposal off airport property of un-encased conduits called for on the plans including all excavation and backfilling necessary to complete the item and restore the area in a manner acceptable to the Engineer.

j. Fence Removal. Fence removal shall consist of the removal of the existing fence fabric, posts, concrete foundations, fabric, hardware and barbwire complete. Existing fence materials that are not damaged or deteriorated may be utilized for the new fence installed under specification F-162. Contractor is responsible for ensuring compatibility of existing materials with new fence.

k. Relocate Habitat Delineation Marker. Existing markers are similar in size and material to fiberglass utility markers. This item includes removing and reinstalling the existing habitat delineation markers to the locations shown on the contract drawings.

152-1.3 Unsuitable Excavation. Any material containing vegetable or organic matter, such as muck, peat, organic silt, or sod shall be considered unsuitable for use in embankment construction. Material, when approved by the Engineer as suitable to support vegetation, may be used on the embankment slope. The excavated area beneath the new construction shall be refilled with material required to stabilize the area or acceptable material as approved by the Engineer.

152-1.4 Existing Topsoil. Refer to soil borings. Existing topsoil shall be stockpiled for screening or processing and reuse. No topsoil from an offsite source will be allowed on this project. Existing sods and herbaceous growth such as grass, lupine, sweet tea, etc. are not to be removed but shall be thoroughly broken up and intermixed with the soil during handling operations. See 905-3.3 for direction on obtaining onsite topsoil. The contractor shall ensure there is sufficient onsite material to be used for topsoil prior to using any existing topsoil in the formation of embankments.

CONSTRUCTION METHODS

152-2.1 General. Before beginning excavation, grading, and embankment operations in any area, the area shall be completely mowed or cleared and grubbed, if applicable. No separate payment shall be made for mowing existing vegetation but rather the work shall be considered incidental to the excavation or embankment. Refer to specification P-151 for details on Clearing and Grubbing.

The suitability of material to be placed in embankments shall be subject to approval by the Engineer. Materials containing organics shall not be placed below pavements. All unsuitable material shall be disposed of offsite or stored in the material storage areas shown on the plans for future use in the project. The height of stockpiles in the storage areas is subject to restrictions as determined by the Engineer.

When the Contractor's excavating operations encounter artifacts of historical or archaeological significance, the operations shall be temporarily discontinued. At the direction of the Engineer, the Contractor shall excavate the site in such a manner as to preserve the artifacts encountered and allow for their removal. Such excavation will be paid for as extra work.

Those areas outside of the pavement areas in which the top layer of soil material has become compacted, by hauling or other activities of the Contractor shall be scarified and disked to a depth of 4 inches (100 mm), in order to loosen and pulverize the soil.

If it is necessary to interrupt existing surface drainage, sewers or under-drainage, conduits, utilities, or similar underground structures, the Contractor shall be responsible for and shall take all necessary precautions to preserve them or provide temporary services. When such facilities are encountered, the Contractor shall notify the Engineer, who shall arrange for their removal if necessary. The Contractor shall, at his/her own expense, satisfactorily repair or pay the cost of all damage to such facilities or structures that may result from any of the Contractor's operations during the period of the contract.

152-2.2 EXCAVATION. No excavation shall be started until the work has been staked out by the Contractor and the Engineer has obtained elevations and measurements of the ground surface. All suitable excavated material shall be used as topsoil, in the formation of embankment, subgrade, or for other purposes shown on the plans. All unsuitable material shall be disposed of off airport property, or as shown on the plans.

When the volume of the excavation exceeds that required to construct the embankments to the grades indicated, the excess shall be disposed of offsite by the contractor. When the volume of excavation is not sufficient for constructing the fill to the grades indicated, the deficiency shall be obtained from borrow areas.

The grade shall be maintained so that the surface is well drained at all times. When necessary, temporary drains and drainage ditches shall be installed to intercept or divert surface water that may affect the work.

The contractor shall be responsible for dewatering the work site as required for the proper and timely prosecution of the various excavation items. Means and methods of dewatering shall be submitted to the engineer for review and approval prior to implementation. No separate measurement and payment shall be made for dewatering, but rather, it shall be considered incidental to the various excavation items.

a. Selective Grading. The more suitable material, as designated by the Engineer, shall be used in constructing the embankment, in capping the pavement subgrade, and as topsoil.

b. Undercutting. Rock, shale, hardpan, loose rock, boulders, or other material unsatisfactory for safety areas, subgrades, roads, shoulders, or any areas intended for turfing shall be excavated to a minimum depth of 12 inches (300 mm), or to the depth specified by the Engineer, below the subgrade. Muck, peat, matted roots, or other yielding material, unsatisfactory for subgrade foundation, shall be removed to the depth specified. Unsuitable materials shall be disposed of off airport property or at locations shown on the plans. This excavated material shall be paid for at the contract unit price per cubic yard for unclassified excavation. The excavated area shall be refilled with suitable material obtained from the grading operations or borrow areas and compacted to specified densities. The necessary refilling will constitute a part of the embankment. Where rock cuts are made and refilled with selected material, any pockets created in the rock surface shall be drained free of water.

c. Overbreak. Overbreak, including slides, is that portion of any material displaced or loosened beyond the finished work as planned or authorized by the Engineer. The Engineer shall determine if the displacement of such material was unavoidable and his/her decision shall be final. All overbreak shall be graded or removed by the Contractor and disposed of as directed; however, payment will not be made for the removal and disposal of overbreak that the Engineer determines as avoidable. Unavoidable overbreak will be classified as "Unclassified Excavation."

d. Removal of Utilities. The removal of existing structures and utilities required to permit the orderly progress of work will be accomplished by someone other than the Contractor, e.g., the utility unless otherwise shown on the plans. All existing foundations shall be excavated for at least 2 feet below the top of subgrade or as indicated on the plans, and the material disposed of as directed. All foundations thus excavated shall be backfilled with suitable material and compacted as specified herein.

e. Compaction Requirements. The subgrade under areas to be paved shall be compacted to a depth of 6 inches and to a density of not less than 100 percent of the maximum density as determined by ASTM D1557. If the material being compacted has more than 30 percent retained on the ¾-inch sieve the in place density shall be 100 percent of the maximum density as determined by AASHTO T-180. The material to be compacted shall be within +/- 2 percent of optimum moisture content before rolled to obtain the prescribed compaction (except for expansive soils).

Subgrade shall be accepted for density on a lot basis. A lot will consist of not more than 2,400 square yards. Each lot shall be divided into two equal sublots. One test shall be made for each subplot. Sampling locations will be determined by the Engineer on a random basis in accordance with statistical procedures contained in ASTM D 3665.

The in-place field density shall be determined in accordance with ASTM D 1556 or ASTM D 2167. Stones or rock fragments larger than 4 inches (100 mm) in their greatest dimension will not be permitted in the top 6 inches of the subgrade. The finished grading operations, conforming to the typical cross section, shall be completed and maintained at least 1,000 feet (300 m) ahead of the paving operations or as directed by the Engineer.

Each lot will be accepted for density when the field density is at least 100 percent of the maximum density of laboratory specimens prepared from samples of the material. If the specified density is not attained, the entire lot shall be reworked and/or recompacted and two additional random tests made. This procedure shall be followed until the specified density is reached.

In lieu of determining field density by ASTM D 1556 Sand-Cone Method, acceptance testing may be accomplished using a nuclear gage in accordance with the current revision of ASTM D 6938. In the field the gage shall be standardized in accordance with paragraph 9 of ASTM D 6938. Standardizing tests shall be conducted on the first lot of material placed that meets the density requirements. Calibration and Standardization shall be conducted in accordance with ASTM and manufactures standards.

If a nuclear gage is used for density determination, two random readings shall be made for each subplot.

In cuts, all loose or protruding rocks on the back slopes shall be barred loose or otherwise removed to line of finished grade of slope. All cut-and-fill slopes shall be uniformly dressed to the slope, cross section, and alignment shown on the plans or as directed by the Engineer.

Blasting will be permitted only when proper precautions are taken for the safety of all persons, the work, and the property. All damage done to the work or property shall be repaired at the Contractor's expense. All operations of the Contractor in connection with the transportation, storage, and use of explosives shall conform to all state and local regulations and explosive manufacturers' instructions, with applicable approved permits reviewed by the Engineer. Any approval given, however, will not relieve the Contractor of his/her responsibility in blasting operations.

Where blasting is approved, the Contractor shall employ a vibration consultant, approved by the Engineer, to advise on explosive charge weights per delay and to analyze records from seismograph recordings. The seismograph shall be capable of producing a permanent record of the three components of the motion in terms of particle velocity, and in addition shall be capable of internal dynamic calibration.

In each distinct blasting area, where pertinent factors affecting blast vibrations and their effects in the area remain the same, the Contractor shall submit a blasting plan of the initial blasts to the Engineer for approval. This plan must consist of hole size, depth, spacing, burden, type of explosives, type of delay sequence, maximum amount of explosive on any one delay period, depth of rock, and depth of overburden if any. The maximum explosive charge weights per delay included in the plan shall not be increased without the approval of the engineering.

The Contractor shall keep a record of each blast fired—its date, time and location; the amount of explosives used, maximum explosive charge weight per delay period, and, where necessary, seismograph records identified by instrument number and location.

These records shall be made available to the Engineer on a monthly basis or in tabulated form at other times as required.

152-2.3 BORROW EXCAVATION. Borrow area(s) within the airport property are indicated on the plans. Borrow excavation shall be made only at these designated locations and within the horizontal and vertical limits as staked or as directed.

When borrow sources are outside the boundaries of the airport property, it shall be the Contractor's responsibility to locate and obtain the supply, subject to the approval of the Engineer. The Contractor shall notify the Engineer, at least 15 days prior to beginning the excavation, so necessary measurements and tests can be made. All unsuitable material shall be disposed of by the Contractor. All borrow pits shall be opened up to expose the vertical face of various strata of acceptable material to enable obtaining a uniform product. Borrow pits shall be excavated to regular lines to permit accurate measurements, and they shall be drained and left in a neat, presentable condition with all slopes dressed uniformly.

152-2.4 DRAINAGE EXCAVATION. Drainage excavation shall consist of excavating for drainage ditches such as intercepting; inlet or outlet, for temporary levee construction; or for any other type as designed or as shown on the

plans. The work shall be performed in the proper sequence with the other construction. All satisfactory material shall be placed in fills; unsuitable material shall be placed in waste areas or as directed. Intercepting ditches shall be constructed prior to starting adjacent excavation operations. All necessary work shall be performed to secure a finish true to line, elevation, and cross section.

The Contractor shall maintain ditches constructed on the project to the required cross section and shall keep them free of debris or obstructions until the project is accepted.

152-2.5 PREPARATION OF EMBANKMENT AREA. Where an embankment is to be constructed to a height of 4 feet or less, all sod and vegetable matter shall be removed from the surface upon which the embankment is to be placed, and the cleared surface shall be completely broken up by plowing or scarifying to a minimum depth of 6 inches. This area shall then be compacted as indicated in paragraph 2.6. When the height of fill is greater than 4 feet, sod not required to be removed shall be thoroughly disked and recompacted to the density of the surrounding ground before construction of embankment.

Where embankments are to be placed on natural slopes steeper than 3H to 1V, horizontal benches shall be constructed into the existing material of sufficient width to permit operations of placing and compacting additional materials or as shown on the plans.

No direct payment shall be made for the work performed under this section. The necessary clearing and grubbing (if applicable) and the quantity of excavation removed will be paid for under the respective items of work.

152-2.6 FORMATION OF EMBANKMENTS. Embankments shall be formed in successive horizontal layers of not more than 8 inches in loose depth for the full width of the cross section, unless otherwise approved by the Engineer.

The grading operations shall be conducted, and the various soil strata shall be placed, to produce a soil structure as shown on the typical cross section or as directed. Materials such as brush, hedge, roots, stumps, grass and other organic matter, shall not be incorporated or buried in the embankment.

Operations on earthwork shall be suspended at any time when satisfactory results cannot be obtained because of rain, freezing, or other unsatisfactory conditions of the field. The Contractor shall drag, blade, or slope the embankment to provide proper surface drainage.

The material in the layer shall be within +/-2 percent of optimum moisture content before rolling to obtain the prescribed compaction. In order to achieve a uniform moisture content throughout the layer, wetting or drying of the material and manipulation shall be required when necessary. Should the material be too wet to permit proper compaction or rolling, all work on all of the affected portions of the embankment shall be delayed until the material has dried to the required moisture content. Sprinkling of dry material to obtain the proper moisture content shall be done with approved equipment that will sufficiently distribute the water. Sufficient equipment to furnish the required water shall be available at all times. Samples of all embankment materials for testing, both before and after placement and compaction, will be taken for each 1,000 cubic yards. Based on these tests, the Contractor shall make the necessary corrections and adjustments in methods, materials or moisture content in order to achieve the correct embankment density.

Rolling operations shall be continued until the embankment is compacted to not less than 95 percent of maximum density for noncohesive soils, and 90 percent of maximum density for cohesive soils as determined by ASTM D1557. If the material being compacted has more than 30 percent retained on the ¾-inch sieve the in place density shall be 100 percent of the maximum density as determined by AASHTO T-180. Under all areas to be paved, the embankments shall be compacted to a depth of 6 inches and to a density of not less than 100 percent of the maximum density as determined by ASTM D1557. If the material being compacted has more than 30 percent retained on the ¾-inch sieve the in place density shall be 100 percent of the maximum density as determined by AASHTO T-180.

On all areas outside of the pavement areas, no compaction will be required on the top 4 inches.

The in-place field density shall be determined in accordance with ASTM D 1556 or ASTM D 2167. In lieu of determining field density by ASTM D 1556 Sand-Cone Method, acceptance testing may be accomplished using a nuclear gage in accordance with the current revision of ASTM D 6938. In the field the gage shall be standardized in accordance with paragraph 9 of ASTM D 6938. Standardizing tests shall be conducted on the first lot of material placed that meets the density requirements. Calibration and Standardization shall be conducted in accordance with ASTM and manufactures standards.

If a nuclear gage is used for density determination, two random readings shall be made for each subplot.

Compaction areas shall be kept separate, and no layer shall be covered by another until the proper density is obtained.

During construction of the embankment, the Contractor shall route his/her equipment at all times, both when loaded and when empty, over the layers as they are placed and shall distribute the travel evenly over the entire width of the embankment. The equipment shall be operated in such a manner that hardpan, cemented gravel, clay, or other chunky soil material will be broken up into small particles and become incorporated with the other material in the layer.

In the construction of embankments, layer placement shall begin in the deepest portion of the fill; as placement progresses, layers shall be constructed approximately parallel to the finished pavement grade line.

When rock and other embankment material are excavated at approximately the same time, the rock shall be incorporated into the outer portion of the embankment and the other material shall be incorporated under the future paved areas. Stones or fragmentary rock larger than 4 inches (100 mm) in their greatest dimensions will not be allowed in the top 6 inches of the subgrade. Rockfill shall be brought up in layers as specified or as directed and every effort shall be exerted to fill the voids with the finer material forming a dense, compact mass. Rock or boulders shall not be disposed of outside the excavation or embankment areas, except at places and in the manner designated by the Engineer.

When the excavated material consists predominantly of rock fragments of such size that the material cannot be placed in layers of the prescribed thickness without crushing, pulverizing or further breaking down the pieces, such material may be placed in the embankment as directed in layers not exceeding 2 feet in thickness. Each layer shall be leveled and smoothed with suitable leveling equipment and by distribution of spalls and finer fragments of rock. These type lifts shall not be constructed above an elevation 4 feet below the finished subgrade.

Frozen material shall not be placed in the embankment nor shall embankment be placed upon frozen material.

There will be no separate measurement of payment for compacted embankment, and all costs incidental to placing in layers, compacting, disking, watering, mixing, sloping, and other necessary operations for construction of embankments will be included in the contract price for excavation, borrow, or other items.

152-2.7 FINISHING AND PROTECTION OF SUBGRADE. After the subgrade has been substantially completed the full width shall be conditioned by removing any soft or other unstable material that will not compact properly. The resulting areas and all other low areas, holes or depressions shall be brought to grade with suitable select material. Scarifying, blading, rolling and other methods shall be performed to provide a thoroughly compacted subgrade shaped to the lines and grades shown on the plans.

Grading of the subgrade shall be performed so that it will drain readily. The Contractor shall take all precautions necessary to protect the subgrade from damage. He/she shall limit hauling over the finished subgrade to that which is essential for construction purposes.

All ruts or rough places that develop in a completed subgrade shall be smoothed and recompacted.

No subbase, base, or surface course shall be placed on the subgrade until the subgrade has been approved by the Engineer.

152-2.8 HAUL. All hauling will be considered a necessary and incidental part of the work. Its cost shall be considered by the Contractor and included in the contract unit price for the pay of items of work involved. No payment will be made separately or directly for hauling on any part of the work.

152-2.9 TOLERANCES. In those areas upon which a subbase or base course is to be placed, the top of the subgrade shall be of such smoothness that, when tested with a 16-foot (4.8 m) straightedge applied parallel and at right angles to the centerline, it shall not show any deviation in excess of 1/2-inch (12 mm), or shall not be more than 0.05-foot (.015 m) from true grade as established by grade hubs or pins. Any deviation in excess of these amounts shall be corrected by loosening, adding, or removing materials; reshaping; and recompacting by sprinkling and rolling.

On safety areas, intermediate and other designated areas, the surface shall be of such smoothness that it will not vary more than 0.10 foot from true grade as established by grade hubs. Any deviation in excess of this amount shall be corrected by loosening, adding or removing materials, and reshaping.

152-2.10 TOPSOIL. When topsoil is specified or required as shown on the plans or under Item T-905, it shall be salvaged from stripping or other grading operations. The topsoil shall meet the requirements of Item T-905. If, at the time of excavation or stripping, the topsoil cannot be placed in its proper and final section of finished construction, the material shall be stockpiled at approved locations. Stockpiles shall not be placed within 350 feet of runway pavement or 125 feet of taxiway pavement and shall not be placed on areas that subsequently will require any excavation or embankment. If, in the judgment of the Engineer, it is practical to place the salvaged topsoil at the time of excavation or stripping, the material shall be placed in its final position without stockpiling or further rehandling.

Upon completion of grading operations, stockpiled topsoil shall be handled and placed as directed, or as required in Item T-905.

No direct payment will be made for topsoil as such under Item P-152. The quantity removed and placed directly or stockpiled shall be paid for at the contract unit price per cubic yard (cubic meter) for "Unclassified Excavation."

When stockpiling of topsoil and later rehandling of such material is directed by the Engineer, the material so rehandled shall be paid for at the contract unit price for "Topsoil," as provided in Item T-905.

152-2.11 UTILITY EXCAVATION. When directed by the Engineer, excavate existing pavements and soils to expose utilities to determine utilities conflict with the proposed improvements. The Contractor shall coordinate excavation for public utilities with utility provider prior to the start of work. The Contractor shall locate the utilities approximate location prior to excavation. The Contractor shall not disturb the utility during the excavation. The Contractor shall provide the top and bottom elevation of the utility as well as the horizontal dimension of the utility. The work shall be conducted in the presence of the Engineer. The Contractor shall backfill, compact and restore all pavement to the original condition.

METHOD OF MEASUREMENT

152-3.1 Unclassified Excavation. The quantity of excavation to be paid for shall be the number of cubic yards measured in its original position.

Measurement shall not include the quantity of materials excavated without authorization beyond normal slope lines, or the quantity of material used for purposes other than those directed.

For payment specified by the cubic yard, measurement for all excavation shall be computed by the average end area method. The end area is that bound by the original ground line established by field cross sections and the final theoretical pay line established by excavation cross sections shown on the plans, subject to verification by the Engineer. After completion of all excavation operations and prior to the placing of base or sub base material, the final excavation shall be verified by the Engineer by means of field cross sections taken randomly at intervals not exceeding 100 linear feet.

Final field cross sections shall be employed if the following changes have been made:

- a. Plan width of embankments or excavations are changed by more than plus or minus 1.0 foot; or
- b. Plan elevations of embankments or excavations are changed by more than plus or minus 0.5 foot.

152-3.2 Structure Removal. The quantity of structures to be paid for shall be the actual number of drainage or electrical structures removed, measured in place.

152-3.3 Drainage Pipe Removal. The quantity of pipe removal to be paid shall be the actual number of linear feet of pipe removed, regardless of the diameter of the pipe or bedding, measured in place to the nearest foot along the centerline of the pipe.

152-3.4 Headwall Removal. Headwall Removal shall be paid for as a single lump sum item.

152-3.5 Elevated Light Removal. The quantity of lights to be paid for shall be the number of elevated runway/taxiway lights removed.

152-3.6 Guidance Sign Removal. The quantity of signs to be paid for shall be the number of guidance signs removed.

152-3.7 Direct Buried Cable Removal. The quantity of cable removal to be paid for shall be the number of linear feet of cable removed measured in place to the nearest foot.

152-3.8 Concrete Encased Duct Bank Removal. The quantity of duct bank removal to be paid for shall be the actual number of linear feet of duct bank removed regardless of the diameter or number of the conduits measured in place to the nearest foot.

152-3.9 Conduit Removal. The quantity of conduit removal to be paid for shall be the actual number of linear feet of conduit removed regardless of the diameter of conduit measured in place to the nearest foot. Removal and disposal of cable which may be in the conduit is incidental.

152-3.10 Fence Removal. The quantity of fence removal to be paid for shall be the actual number of linear feet of fence removed measured in place along the top of the fence from center to center of end posts, including the length occupied by gate openings.

152-3.11 Relocate Habitat Delineation Marker. The quantity of relocated markers to be paid for shall be the actual number of markers removed, relocated and reset.

152-3.12 Embankment in Place. The quantity of embankment to be paid for shall be the number of cubic yards measured in its final position.

Measurement shall not include the quantity of materials constructed without authorization beyond normal slope lines, or the quantity of material used for purposes other than those directed.

For payment specified by the cubic yard, measurement for all embankments shall be computed by the average end area method. The end area is that bound by the original ground line established by field cross sections and the final theoretical pay line established by embankment cross sections shown on the plans, subject to verification by the Engineer. After completion of all embankment operations and prior to the placing of base or sub base material, the final embankment shall be verified by the Engineer by means of field cross sections taken randomly at intervals not exceeding 100 linear feet.

Final field cross sections shall be employed if the following changes have been made:

- c. Plan width of embankments are changed by more than plus or minus 1.0 foot; or

- d. Plan elevations of embankments are changed by more than plus or minus 0.5 foot.

BASIS OF PAYMENT

152-4.1 For "Unclassified Excavation" payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.

152-4.2 For "Structure Removal" payment shall be made at the contract unit price per each. This price shall be full compensation for furnishing all materials, labor, equipment, tools and incidentals necessary to complete the item. Incidental to the structure removal shall be the legal disposal of all debris off site, and backfill and compaction of the resulting excavation with existing suitable material as determined by the engineer.

152-4.3 For "Drainage Pipe Removal" payment shall be made at the contract unit price per linear foot. This price shall be full compensation for furnishing all materials, labor, equipment, tools, excavation, and incidentals necessary to complete the item. Incidental to the removal shall be the legal disposal of all debris, regardless of material, and backfill and compaction of the resulting excavation with existing suitable material as determined by the engineer.

152-4.4 For "Headwall Removal" payment shall be made at the contract lump sum price. This price shall be full compensation for furnishing all materials, labor, equipment, tools, excavation, offsite disposal, backfill, and incidentals necessary to complete the item.

152-4.5 For "Elevated Light Removal" payment shall be made at the contract unit price per each including lights, stakes, bases, transformers and incidentals. This price shall be full compensation for furnishing all materials, labor, equipment, tools and incidentals necessary to complete the item. Incidental to this item shall be the legal disposal of all debris off site, and backfill and compaction of the resulting excavation with existing suitable material as determined by the engineer. Upon request, the owner reserves the right to keep any materials including lights, transformers, etc. for use as spare parts.

152-4.6 For "Guidance Sign Removal" payment shall be made at the contract unit price per each. This price shall be full compensation for furnishing all materials, labor, equipment, tools and incidentals necessary to complete the item including removal of the sign and foundation. Incidental to this item shall be the legal disposal of all debris off site, and backfill and compaction of the resulting excavation with existing suitable material as determined by the engineer.

152-4.7 For "Direct Buried Cable Removal" payment shall be made at the contract unit price per linear foot. This price shall be full compensation for furnishing all materials, labor, equipment, tools, excavation, and incidentals necessary to complete the item. Incidental to the removal shall be the legal disposal of all debris, regardless of material, and backfill and compaction of the resulting excavation with existing suitable material as determined by the engineer.

152-4.8 For "Concrete Encased Duct Bank Removal" payment shall be made at the contract unit price per linear foot. This price shall be full compensation for furnishing all materials, labor, equipment, tools, excavation, and incidentals necessary to complete the item. Incidental to the removal shall be the legal disposal of all debris including cables, regardless of material, and backfill and compaction of the resulting excavation with existing suitable material as determined by the engineer.

152-4.9 For "Conduit Removal" payment shall be made at the contract unit price per linear foot. This price shall be full compensation for furnishing all materials, labor, equipment, tools, excavation, and incidentals necessary to complete the item. Incidental to the removal shall be the legal disposal of all debris including cables, regardless of material, and backfill and compaction of the resulting excavation with existing suitable material as determined by the engineer.

152-4.10 For "Fence Removal" payment shall be made at the contract unit price per linear foot. This price shall be full compensation for furnishing all materials, labor, equipment, tools, excavation, and incidentals necessary to complete the item. Incidental to the removal shall be the legal disposal of all debris including posts fabric, concrete

and hardware, regardless of material, and backfill and compaction of the resulting excavation with existing suitable material as determined by the engineer.

152-4.11 For “Relocate Habitat Delineation Marker” payment shall be made at the contract unit price per each. This price shall be full compensation for furnishing all materials, labor, equipment, tools and incidentals necessary to complete the item including removal, relocation and installation of the marker.

152-4.12 For “Embankment in Place” payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-152-1	Unclassified Excavation	per Cubic Yard
Item P-152-2	Structure Removal	per Each
Item P-152-3	Drainage Pipe Removal	per Linear Foot
Item P-152-4	Headwall Removal	per Lump Sum
Item P-152-5	Elevated Light Removal	per Each
Item P-152-6	Guidance Sign Removal	per Each
Item P-152-7	Direct Buried Cable Removal	per Linear Foot
Item P-152-8	Concrete Encased Duct Bank Removal	per Linear Foot
Item P-152-9	Conduit Removal	per Linear Foot
Item P-152-10	Fence Removal	per Linear Foot
Item P-152-11	Relocate Habitat Delineation Marker	per Each
Item P-152-12	Embankment in Place	per Cubic Yard

TESTING REQUIREMENTS

ASTM D 698	Tests for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5-pound Rammer and 12-inch Drop
ASTM D 1556	Test for Density of Soil In Place by the Sand-Cone Method
ASTM D 1557	Test for Laboratory Compaction Characteristics of Soil Using Modified Effort
ASTM D 2167	Test for Density and Unit Weight of Soil In Place by the Rubber Balloon Method
ASTM D 6938	Standard Test Method for In-Place Density and Water Content of Soil and Soil – Aggregate by Nuclear Methods (Shallow Depth)

END OF ITEM P-152

ITEM P- 154
SUBBASE COURSE

CONTRACT DOCUMENTS

154-0.1 This section of these specifications is a part of the Contract Documents as defined in the Contract Articles. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other sections.

Attention shall be directed to the sections of these specifications entitled, “Summary of Work and Special Work Requirements” and “Supplemental Contract Articles”.

DESCRIPTION

154-1.1 This item shall consist of a subbase course composed of granular materials constructed on a prepared subgrade or underlying course in accordance with these specifications, and in conformity with the dimensions and typical cross section shown on the plans.

MATERIALS

154-2.1 MATERIALS. The subbase material shall consist of hard durable particles or fragments of granular aggregates. This material will be mixed or blended with fine sand, clay, stone dust, or other similar binding or filler materials produced from approved sources. This mixture must be uniform and shall comply with the requirements of these specifications as to gradation, soil constants, and shall be capable of being compacted into a dense and stable subbase. The material shall be free from vegetable matter, lumps or excessive amounts of clay, and other objectionable or foreign substances. Pit-run material may be used, provided the material meets the requirements specified.

TABLE 1. GRADATION REQUIREMENTS

Sieve designation (square openings) as per ASTM C 136 and ASTM D 422	Percentage by weight passing sieves
3 inch (75.0 mm)	100
No. 10 (2.0 mm)	20-100
No. 40 (0.450 mm)	5-60
No. 200 (0.075 mm)	0-8

The portion of the material passing the No. 40 (0.450 mm) sieve shall have a liquid limit of not more than 25 and a plasticity index of not more than 6 when tested in accordance with ASTM D 4318.

The maximum amount of material finer than 0.02 mm in diameter shall be less than 3%.

154-2.2 Samples and Certification. A sample of the material shall be submitted by the Contractor for approval prior to the start of work. A manufacturer’s certification that shows that these materials conform to the requirements of this specification shall be provided. The sample submittal and certification shall be completed and approved prior to the start of work. The Contractor shall bear all costs associated with providing the samples and certifications.

CONSTRUCTION METHODS

154-3.1 GENERAL. The subbase course shall be placed where designated on the plans or as directed by the Engineer. The material shall be shaped and thoroughly compacted within the tolerances specified.

Granular subbases which, due to grain sizes or shapes, are not sufficiently stable to support without movement the construction equipment, shall be mechanically stabilized to the depth necessary to provide such stability as directed by the Engineer. The mechanical stabilization shall principally include the addition of a fine-grained medium to

bind the particles of the subbase material sufficiently to furnish a bearing strength, so that the course will not deform under the traffic of the construction equipment. The addition of the binding medium to the subbase material shall not increase the soil constants of that material above the limits specified.

154-3.2 OPERATION IN PITS. All work involved in clearing and stripping pits and handling unsuitable material encountered shall be performed by the Contractor at his/her own expense. The subbase material shall be obtained from pits or sources that have been approved. The material in the pits shall be excavated and handled in such manner that a uniform and satisfactory product can be secured.

154-3.3 PREPARING UNDERLYING COURSE. Before any subbase material is placed, the underlying course shall be prepared and conditioned as specified. The course shall be checked and accepted by the Engineer before placing and spreading operations are started.

To protect the subgrade and to ensure proper drainage, the spreading of the subbase shall begin along the centerline of the pavement on a crowned section or on the high side of pavements with a one-way slope.

154-3.4 MATERIALS ACCEPTANCE IN EXISTING CONDITION. When the entire subbase material is secured in a uniform and satisfactory condition and contains approximately the required moisture, such approved material may be moved directly to the spreading equipment for placing. The material may be obtained from gravel pits, stockpiles, or may be produced from a crushing and screening plant with the proper blending. The materials from these sources shall meet the requirements for gradation, quality, and consistency. It is the intent of this section of the specifications to secure materials that will not require further mixing. The moisture content of the material shall be approximately that required to obtain maximum density. Any minor deficiency or excess of moisture may be corrected by surface sprinkling or by aeration. In such instances, some mixing or manipulation may be required, immediately preceding the rolling, to obtain the required moisture content. The final operation shall be blading or dragging, if necessary, to obtain a smooth uniform surface true to line and grade.

154-3.5 PLANT MIXING. When materials from several sources are to be blended and mixed, the subbase material shall be processed in a central or travel mixing plant. The subbase material, together with any blended material, shall be thoroughly mixed with the required amount of water. After the mixing is complete, the material shall be transported to and spread on the underlying course without undue loss of the moisture content.

154-3.5.1 MIXED IN PLACE. When materials from different sources are to be proportioned and mixed or blended in place, the relative proportions of the components of the mixture shall be as designated by the Engineer.

The subbase material shall be deposited and spread evenly to a uniform thickness and width. Then the binder, filler or other material shall be deposited and spread evenly over the first layer. There shall be as many layers of materials added as the Engineer may direct to obtain the required subbase mixture.

When the required amount of materials have been placed, they shall be thoroughly mixed and blended by means of graders, discs, harrows, rotary tillers, supplemented by other suitable equipment if necessary. The mixing shall continue until the mixture is uniform throughout. Areas of segregated material shall be corrected by the addition of binder or filler material and by thorough remixing. Water in the amount and as directed by the Engineer shall be uniformly applied prior to and during the mixing operations, if necessary, to maintain the material at its required moisture content. When the mixing and blending has been completed, the material shall be spread in a uniform layer which, when compacted, will meet the requirements of thickness and typical cross section.

154-3.6 GENERAL METHODS FOR PLACING. The subbase course shall be constructed in layers. Any layer shall be not less than 3 inches (75 mm) nor more than 8 inches (200 mm) of compacted thickness. The subbase material shall be deposited and spread evenly to a uniform thickness and width. The material, as spread, shall be of uniform gradation with no pockets of fine or coarse materials. The subbase, unless otherwise permitted by the Engineer, shall not be spread more than 2,000 square yards (1700 square meters) in advance of the rolling. Any necessary sprinkling shall be kept within this limit. No material shall be placed in snow or on a soft, muddy, or frozen course.

When more than one layer is required, the construction procedure described herein shall apply similarly to each layer.

During the placing and spreading, sufficient caution shall be exercised to prevent the incorporation of subgrade, shoulder, or foreign material in the subbase course mixture.

154-3.7 FINISHING AND COMPACTING. After spreading or mixing, the subbase material shall be thoroughly compacted by rolling and sprinkling, when necessary. Sufficient rollers shall be furnished to adequately handle the rate of placing and spreading of the subbase course.

The field density of the compacted material shall be at least 100 percent of the maximum density of laboratory specimens prepared from samples of the subbase material delivered to the jobsite. The laboratory specimens shall be compacted and tested in accordance with ASTM D1557. If the material being compacted has more than 30 percent retained on the 3/4-inch sieve the in place density shall be 100 percent of the maximum density as determined by AASHTO T-180. The in-place field density shall be determined in accordance with ASTM D 1556 or ASTM D 2167. The moisture content of the material at the start of compaction shall not be below nor more than 2 percentage points above the optimum moisture content. Material meeting the requirements of Item P-154 may be free-draining which may prevent the material from retaining sufficient moisture to meet the moisture at compaction requirements of this paragraph. If this situation occurs during field operations, minimum moisture content should be established for placement of the material.

In lieu of determining field density by ASTM D 1556 Sand-Cone Method, acceptance testing may be accomplished using a nuclear gage in accordance with the current revision of ASTM D 6938. In the field the gage shall be standardized in accordance with paragraph 9 of ASTM D 6938. Standardizing tests shall be conducted on the first lot of material placed that meets the density requirements. Calibration and Standardization shall be conducted in accordance with ASTM and manufactures standards.

If a nuclear gage is used for density determination, two random readings shall be made for each subplot.

When nuclear density gages are to be used for density determination, testing shall be in accordance with Section 120.

The course shall not be rolled when the underlying course is soft or yielding or when the rolling causes undulation in the subbase. When the rolling develops irregularities that exceed 1/2 inch when tested with a 16-foot straightedge, the irregular surface shall be loosened and then refilled with the same kind of material as that used in constructing the course and again rolled as required above.

Along places inaccessible to rollers, the subbase material shall be tamped thoroughly with mechanical or hand tampers.

Sprinkling during rolling, if necessary, shall be in the amount and by equipment approved by the Engineer. Water shall not be added in such a manner or quantities that free water will reach the underlying layer and cause it to become soft.

154-3.8 SURFACE TEST. After the course is completely compacted, the surface shall be tested for smoothness and accuracy of grade and crown; any portion found to lack the required smoothness or to fail in accuracy of grade or crown shall be scarified, reshaped, recompact, and otherwise manipulated as the Engineer may direct until the required smoothness and accuracy re obtained. The finished surface shall not vary more than 1/2 inch when tested with a 16-foot straightedge applied parallel with, and at right angles to, the centerline.

154-3.9 THICKNESS. The thickness of the completed subbase course shall be determined by depth tests or sample holes taken at intervals so each test shall represent no more than 500 square yards. When the deficiency in thickness is more than 1/2 inch, the Contractor shall correct such areas by scarifying, adding satisfactory mixture, rolling, sprinkling, reshaping, and finishing in accordance with these specifications. The Contractor shall replace at his/her expense the subbase material where borings are taken for test purposes.

In lieu of test holes the Contractor or Engineer may at his discretion may use survey to determine thickness.

154-3.10 PROTECTION. Work on subbase course shall not be conducted during freezing temperature nor when the subgrade is wet. When the subbase material contains frozen material or when the underlying course is frozen, the construction shall be stopped.

154-3.11 MAINTENANCE. Following the final shaping of the material, the subbase shall be maintained throughout its entire length by the use of standard motor graders and rollers until, in the judgment of the Engineer, the subbase meets all requirements and is acceptable for the construction of the next course.

METHOD OF MEASUREMENT

154-4.1 The yardage of subbase course to be paid for shall be the number of **cubic yards** of subbase course material placed, compacted, and accepted in the completed course. The quantity of subbase course material shall be measured in final position based upon depth tests or cores taken as directed by the Engineer, or at the rate of 1 depth test for each 500 square yards of subbase course, or by means of average end areas on the complete work computed from elevations to the nearest 0.01 foot. On individual depth measurements, thicknesses more than 1/2 inch in excess of that shown on the plans shall be considered as the specified thickness plus 1/2 inch in computing the yardage for payment. Subbase materials shall not be included in any other excavation quantities.

BASIS OF PAYMENT

154-5.1 Payment shall be made at the contract unit price per cubic yard for subbase course. This price shall be full compensation for furnishing all materials; for all preparation, hauling, and placing of these materials; and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-154-1	Subbase Course	per cubic yard
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TESTING REQUIREMENTS

ASTM C 136 Sieve Analysis of Fine and Course Aggregates

ASTM D 422 Particle Size Analysis of Soils

ASTM D 1556 Density of Soil in Place by the Sand-Cone Method

ASTM D 1557 Test for Laboratory Compaction Characteristics of Soil Using Modified Effort

ASTM D 4318 Liquid Limit, Plastic Limit, and Plasticity Index of Soils

ASTM D 6938 Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

AASHTO T 180 Standard Method of Test for Moisture-Density Relations of Soils Using a 10-lb Hammer and a 18-in. Drop

END OF ITEM P-154

ITEM P-156

TEMPORARY AIR AND WATER POLLUTION, SOIL EROSION, AND SILTATION CONTROL

CONTRACT DOCUMENTS

156-0.1 This section of these specifications is a part of the Contract Documents as defined in the General Conditions. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other sections.

Attention shall be directed to the sections of these specifications entitled, "Summary of Work and Special Work Requirements" and "Supplemental Contract Articles".

DESCRIPTION

156-1.1 This item shall consist of temporary control measures as shown on the plans or as ordered by the Engineer during the life of a contract to control water pollution, soil erosion, and siltation through the use of berms, dikes, dams, sediment basins, fiber mats, gravel, mulches, grasses, slope drains, and other erosion control devices or methods.

The temporary erosion control measures contained herein shall be coordinated with the permanent erosion control measures specified as part of this contract to the extent practical to assure economical, effective, and continuous erosion control throughout the construction period.

Temporary control may include work outside the construction limits such as borrow pit operations, equipment and material storage sites, waste areas, and temporary plant sites.

This work shall also consist of the development of a temporary Erosion and Sediment Control and Stormwater Management Plan, hereinafter called the "Plan". The work includes all necessary preparations for submissions and revisions of the Plan to obtain approval by the Engineer. This work shall also include monitoring the approved Plan during all phases of construction.

Recommended guides for the preparation of the Plan are the AASHTO Highway Drainage Guideline, Volume III, *Guidelines for Erosion and Sediment Control in Highway Construction*, available from the American Association of State Highway and Transportation Officials, Inc., 444 North Capitol St. N.W., Suite 249, Washington, D.C. 20001; the *Stormwater Management and Erosion and Sediment Control Handbook for Urban and Developing Areas in New Hampshire* available from the New Hampshire Department of Environmental Services (NHDES) Public Information and Permitting Office, PO Box 95, 6 Hazen Drive, Concord, NH 03302-0095, Telephone (603) 271-2975 and the Rockingham County Conservation District in Exeter, NH, Telephone (603) 772-4385; the NHDOT Guidelines for Temporary Erosion and Sediment Control and Stormwater Management (latest edition); the NHDES web site for latest guidance documents.

MATERIALS

156-2.1 GRASS. Grass for temporary stabilization shall not compete with the grasses sown later for permanent cover. Grass for stabilization shall be ryegrass and be suitable to the area providing a temporary cover. All seed shall be 100% weed free and free from invasive species.

156-2.2 MULCHES. Mulches for temporary erosion control shall meet the requirements of T-901-2.5 mulch.

156-2.3 SLOPE DRAINS. Slope drains may be constructed of pipe, fiber mats, rubble, portland cement concrete, bituminous concrete, or other materials that will adequately control erosion.

156-2.4 EROSION BLANKET. Erosion blanket shall be Curlex I Fibrenet or approved equal. Erosion blankets must be free of weeds or seeds and shall be "wildlife friendly."

156-2.5 COIR LOGS. Coir logs shall be of the size shown on the contract drawings and be filled with wood chips or other inert material that will not contain weeds or seeds of invasive species.

156-2.6 INLET PROTECTION. Drain inlet protection shall consist of a permeable geotextile that allows water to pass but prevents silt and sediment from entering the drainage system. The geotextile shall be installed under and integral to the catchbasin grate. The geotextile shall have lifting devices that allow the removal of the geotextile without allowing sediment to enter the drainage network. All drain grate opening sizes are estimated to be 2' x 4' size drains. Contractor shall confirm drain grate sizes prior to ordering.

Table 1 Physical Requirements

Grab Strength (lbs)	ASTM D 4632	375
Max. Elongation (%)	ASTM D 4632	30%
Puncture Strength (lbs)	ASTM D 4833	140
Burst Strength (psi)	ASTM D 3768	600
Trapezoid Tear (lbs)	ASTM D 4533	120
Apparent Opening Size (mm)	ASTM D 4751	0.212
Permittivity (Sec ⁻¹)	ASTM D 4491	1.5
Water Flow Rate (gal/min/sf)	ASTM D 4491	140
Ultraviolet Degradation (% Retained Strength)	ASTM D 4355	90

156-2.7 SNAKE PASSAGE. Snake passages shall be as shown on the contract drawings. Snake passages can be purchased at the following location:

<http://www.wapoultryequipment.net.au/products/snake-traps-reptiles-funnel-trap>

156-2.8 SILT FENCE. Geotextile filter fabric for silt fence shall be made from polypropylene, polyester, or other approved polymeric chemically stable material and resistant to ultraviolet radiation degradation for at least 12 months. Silt retention capacity shall be no less than 75 percent of silt and suspended solids. The fabric shall meet the following requirements.

<u>Fabric Property</u>	<u>Test Method</u>	<u>Property Requirement*</u>
Grab Tensile Strength (lbs)	ASTM D 4632	100 Minimum
Grab Tensile Elongation (%)	ASTM D 4632	25 Maximum
Puncture Strength (lbs)	ASTM D 4833	60 Minimum
Mullen Burst Strength (psi)	ASTM D 3786	210 Minimum
Trapezoid Tear Strength (lbs)	ASTM D 4533	60 Minimum

*All properties are minimum or maximum average roll values (i.e. the test results for any sampled roll in a lot shall meet or exceed the minimum values or be less than or meet the maximum value in the table.)

Posts for silt fence shall be either wood or steel. Wood posts shall be sound quality hardwood with a minimum cross sectional area of 1.6 sq. in. (1,033 sq. mm). Steel post shall be standard T or U section weighing not less than 1 pound per linear ft. (1.5 kilograms per linear meter) with projections for fastening wire to the fence. Maximum post spacing shall be 10 ft. (3 m).

156-2.9 CONSTRUCTION ENTRANCES. Stone used for construction entrances shall consist of clean, durable fragments of ledge rock of uniform quality, reasonably free from thin or elongated pieces. The stone shall be made from rock which is free from topsoil and other organic material. The stone shall be graded as follows:

Sieve Size	Percent Passing
12 in	100
4 in	50 -90
1-1/2 in	0 -30
3/4 in	0 -10

Filter fabric used for construction entrances shall be shall conform to the requirements of AASHTO M 288-99, Class 2. The fabric shall meet the following requirements:

<u>Fabric Property</u>	<u>Test Method</u>	<u>Property Requirement</u>
Grab Tensile Strength (lbs)	ASTM D 4632	135 Minimum
Grab Tensile Elongation (%)	ASTM D 4632	50 Maximum
Puncture Strength (lbs)	ASTM D 4833	350 Minimum
Trapezoid Tear Strength (lbs)	ASTM D 4533	245 Minimum
Flow Rate (gal/min/ft ²)	ASTM D 4491	108 Minimum
Apparent Opening Size (US Sieve)	ASTM D 4751	70 (0.21mm) Maximum
Permittivity (Sec ⁻¹)	ASTM D 4491	1.4 Minimum
Ultraviolet Degradation (% Retained Strength)	ASTM D 4355	70 @500 Hrs Minimum

156-2.10 OTHER. All other materials shall meet commercial grade standards and shall be approved by the Engineer before being incorporated into the project. The contractor's attention is directed to the NHDOT Qualified Product Lists at <http://www.nh.gov/dot/bureaus/materialsandresearch/research/products/index.htm> for Erosion Blankets and Storm Drain Inlet protection products.

CONSTRUCTION REQUIREMENTS

156-3.1 GENERAL. In the event of conflict between these requirements and pollution control laws, rules, or regulations of other Federal, state, or local agencies, the more restrictive laws, rules, or regulations shall apply.

The Engineer shall be responsible for assuring compliance to the extent that construction practices, construction operations, and construction work are involved.

156-3.2 SCHEDULE. Prior to the start of construction, the Contractor shall submit schedules for accomplishment of temporary and permanent erosion control work, as are applicable for clearing and grubbing; grading; construction; paving; and similar. The Contractor shall also submit a proposed method of erosion and dust control on haul roads and borrow pits and a plan for disposal of waste materials. Work shall not be started until the erosion control schedules and methods of operation for the applicable construction have been accepted by the Engineer.

156-3.3 AUTHORITY OF ENGINEER. The Engineer has the authority to limit the surface area of erodible earth material exposed by clearing and grubbing, to limit the surface area of erodible earth material exposed by excavation, borrow and fill operations, and to direct the Contractor to provide immediate permanent or temporary pollution control measures to minimize contamination of adjacent streams or other watercourses, lakes, ponds, or other areas of water impoundment.

156-3.4 CONSTRUCTION DETAILS. The Contractor will be required to incorporate all permanent erosion control features into the project at the earliest practicable time as outlined in the accepted schedule. Except where future construction operations will damage slopes, the Contractor shall perform the permanent seeding and mulching and other specified slope protection work in stages, as soon as substantial areas of exposed slopes can be made available. Temporary erosion and pollution control measures will be used to correct conditions that develop during construction that were not foreseen during the design stage; that are needed prior to installation of permanent control

features; or that are needed temporarily to control erosion that develops during normal construction practices, but are not associated with permanent control features on the project.

Where erosion is likely to be a problem, clearing and grubbing operations should be scheduled and performed so that grading operations and permanent erosion control features can follow immediately thereafter if the project conditions permit; otherwise, temporary erosion control measures may be required between successive construction stages.

The Engineer will limit the area of clearing and grubbing, excavation, borrow, and embankment operations in progress, commensurate with the Contractor's capability and progress in keeping the finish grading, mulching, seeding, and other such permanent control measures current in accordance with the accepted schedule. Should seasonal limitations make such coordination unrealistic, temporary erosion control measures shall be taken immediately to the extent feasible and justified.

In the event that temporary erosion and pollution control measures are required due to the Contractor's negligence, carelessness, or failure to install permanent controls as a part of the work as scheduled or are ordered by the Engineer, such work shall be performed by the Contractor at his/her own expense.

The Engineer may increase or decrease the area of erodible earth material to be exposed at one time as determined by analysis of project conditions. The erosion control features installed by the Contractor shall be acceptably maintained by the Contractor during the construction period.

Whenever construction equipment must cross watercourses at frequent intervals, and such crossings will adversely affect the sediment levels, temporary structures should be provided.

Pollutants such as fuels, lubricants, bitumen, raw sewage, wash water from concrete mixing operations, and other harmful materials shall not be discharged into or near rivers, streams, and impoundments or into natural or manmade channels leading thereto.

156-3.5 EROSION AND SEDIMENT CONTROL AND STORMWATER MANAGEMENT PLAN. The Plan shall be prepared, stamped and signed by a Licensed Professional Engineer registered in the State of New Hampshire qualified to prepare erosion and sediment control plans, hereinafter called the "Preparer". Collaboration with other professionals such as soil scientists, geologists and environmentalists may be required as appropriate.

Qualifications for the Plan Preparer shall include a minimum of 5 years experience or knowledge of highway and bridge construction operations, with knowledge of methods of construction, demonstrated knowledge of erosion and sediment control, and stormwater management measures. The preparer shall have previously submitted accepted plans to the New Hampshire Department of Environmental Services (NHDES) under RSA 485-A: 17 Terrain Alteration, or have prepared accepted plans under the National Pollutant Discharge Elimination System permit program.

Qualifications for the Plan Monitor shall include a minimum of 2 years experience or knowledge of highway and bridge construction with knowledge of methods of construction, demonstrated field knowledge of erosion control measures; their design, effectiveness, and maintenance requirements.

The Contractor shall submit the name and qualifications of the person(s) or firm proposed to prepare and monitor the Plan for approval prior to preparing the Plan. Submittal of the name and qualifications will be accepted after the opening of bids.

The Plan shall be developed using a combination of structural, non-structural and vegetative Best Management Practices (BMPs) to adequately control erosion and sedimentation and manage stormwater, as recommended in this specification and in accordance with the the project plans. The Plan shall contain a narrative, plan drawings and design calculations and specifications associated with the Contractor's proposed construction phasing.

The narrative shall contain site-specific information describing existing site(s) conditions, description of the project, soils, and environmentally sensitive areas. A discussion of the various erosion and sediment control and stormwater management BMPs, the stabilization methods for temporary measures, a schedule of construction phasing, and a schedule for monitoring and maintaining the plan shall also be included. BMPs for seasonal (i.e. cold weather/frozen ground) applications shall be identified. The construction phasing shall address the various erosion and sediment control and stormwater management measures to be implemented at each phase of construction. Phases shall be as shown on the plans or as indicated by the Contractor's approved schedule of operations.

Drawings will show the construction site(s) conditions prior to and after construction by including property lines, right-of-way lines, easements, existing and new structures, drainage, flood plains, wetlands, limits of clearing and grading, proposed final drainage, detours, permanent erosion and sediment control measures, and other critical items. The Contractor's plan drawings shall show temporary drainage and erosion and sediment control measures for the construction site(s) on the contract plans. Additionally, the Contractor shall provide plans showing all of the above items for proposed areas related to the construction site(s) not shown on the contract plans, including but not limited to, access and haul roads, equipment and material storage sites, material pits, material processing sites, and disposal areas, except municipally authorized landfill areas and commercial sites. Waste materials are quite often materials unsuitable for embankment construction and generally very susceptible to erosion; therefore, the Contractor shall pay close attention to controlling erosion of these materials.

Additional design typical details illustrating practices for erosion and sediment control not shown on the project drawings shall be included in the Plan. Calculations shall be included to verify all erosion and sediment control and stormwater management practices such as, but not limited to, sediment retention and detention basins, energy dissipators, diversions, waterways, and control of runoff.

The Preparer or the Preparer's designated representative shall assist the Contractor in implementing the Plan, monitor the site for compliance with the Plan and recommend modifications to the Plan for changing operations or inadequate erosion and sediment control and stormwater management measures. The Preparer shall make modifications to the Plan as necessary and resubmit for review and approval. Review time of modifications will be within 10 working days of submittal.

Monitoring Erosion and Sediment Control shall include on-site reviews, in accordance with the SWPP. Monitoring report prepared by the Plan Monitor stating the date of review and describing the erosion and sediment control and stormwater management measures reviewed, the effectiveness of their operation, any deficiencies, and corrective actions to be undertaken shall be prepared after each review. A copy shall be provided to the Engineer and maintained on file at the project site.

The Plan shall include the preparation and submittal by the Contractor of the US EPA Notice of Intent prior to construction and Notice of Termination at the end of construction. Forms are available on the US EPA web site. Copies of all documents shall be made available to the Engineer. The Engineer may order modifications to the Plan

for changing operations or for inadequate erosion and sediment control and stormwater management measures. Changes and/or modifications shall be noted by the Plan Preparer on the approved Plan located at the project site.

The Preparer of the Plan shall be available for on-site consultations with the Engineer within 24 hours of request. The Owner reserves the right to request a replacement Monitor.

Project work may be suspended, wholly or in part, with no extension of time or additional compensation for failure to implement and maintain the approved Plan, including modifications.

METHOD OF MEASUREMENT

156-4.1 Temporary erosion and pollution control work required which is not attributed to the Contractor's negligence, carelessness, or failure to install permanent controls will be performed as scheduled or ordered by the Engineer. Completed and accepted work will be measured as follows:

- a. Siltation Fence will be measured by the linear foot to the nearest foot. Measurement will be along the top of the fence for each continuous run in place.
- b. Coir Log Sediment Barrier will be measured by the linear foot to the nearest foot. Measurement will be along the top of the barrier for each continuous run in place.
- c. Coir Log Sediment Berm will be measured by the linear foot to the nearest foot. Measurement will be along the top of the berm for each continuous run in place.
- d. Construction Exit will be measured by the number of exits constructed as detailed on the plans.
- e. Inlet protection will be measured by the number of inlets protected as detailed on the plans.
- f. Erosion Control Blanket shall be measured by the number of square yards installed as detailed on the plans.

156-4.2 Erosion and Sediment Control and Stormwater Management Plan will be measured as a unit. A unit will include preparation, submittals, modifications, resubmittals, monitoring of the construction site, and report preparation.

156-4.3 Control work performed for protection of construction areas outside the construction limits, such as borrow and waste areas, haul roads, equipment and material storage sites, and temporary plant sites, will not be measured and paid for directly but shall be considered as a subsidiary obligation of the Contractor with costs included in the contract prices bid for the items to which they apply.

BASIS OF PAYMENT

156-5.1 Accepted quantities of temporary water pollution, soil erosion, and siltation control work ordered by the Engineer and measured as provided in paragraph 156-4.1 will be paid for as follows:

Payment shall be made under:

<u>ITEM</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
P-156-1	Silt Fence	per Linear Foot
P-156-2	Coir Log Sediment Barrier	per Linear Foot
P-156-3	Coir Log Sediment Berm	per Linear Foot

P-156-4	Construction Exit	per Each
P-156-5	Erosion Control Blanket	per Square Yard
P-156-6	Inlet Protection	per Each
P-156-7	Erosion and Sediment Control and Stormwater Management Plan	per Lump Sum

Where other directed work falls within the specifications for a work item that has a contract price, the units of work shall be measured and paid for at the contract unit price bid for the various items.

Temporary control features not covered by contract items that are ordered by the Engineer will be paid for in accordance with Section 90-05.

END OF ITEM P-156

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ITEM P- 209
CRUSHED AGGREGATE BASE COURSE

CONTRACT DOCUMENTS

209-0.1 This section of these specifications is a part of the Contract Documents as defined in the Contract Articles. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other sections.

Attention shall be directed to the sections of these specifications entitled, "Summary of Work and Special Work Requirements" and "Supplemental Contract Articles".

DESCRIPTION

209-1.1 This item consists of a base course composed of crushed aggregates constructed on a prepared course in accordance with these specifications and in conformity to the dimensions and typical cross sections shown on the plans.

MATERIALS

209-2.1 AGGREGATE. Aggregates shall consist of clean, sound, durable particles of crushed stone, crushed gravel, or crushed slag and shall be free from coatings of clay, silt, vegetable matter, and other objectionable materials and shall contain no clay balls. Fine aggregate passing the No. 4 (4.75 mm) sieve shall consist of fines from the operation of crushing the coarse aggregate. If necessary, fine aggregate may be added to produce the correct gradation. The fine aggregate shall be produced by crushing stone, gravel, or slag that meets the requirements for wear and soundness specified for coarse aggregate.

The crushed slag shall be an air-cooled, blast furnace slag and shall have a unit weight of not less than 70 pounds per cubic foot when tested in accordance with ASTM C 29.

The coarse aggregate portion, defined as the material retained on the No. 4 (4.75 mm) sieve and larger, shall contain not more than 15 percent, by weight, of flat or elongated pieces as defined in ASTM D 693 and shall have at least 90 percent by weight of particles with at least two fractured faces and 100 percent with at least one fractured face. The area of each face shall be equal to at least 75 percent of the smallest midsectional area of the piece. When two fractured faces are contiguous, the angle between the planes of fractures shall be at least 30 to count as two fractured faces.

The percentage of wear shall not be greater than 45 percent when tested in accordance with ASTM C 131. The sodium sulfate soundness loss shall not exceed 12 percent, after 5 cycles, when tested in accordance with ASTM C 88.

The fraction passing the No. 40 sieve shall have a liquid limit no greater than 25 and a plasticity index of not more than 4 when tested in accordance with ASTM D 4318. The fine aggregate shall have a minimum sand equivalent value of 35 when tested in accordance with ASTM D 2419.

a. Sampling and Testing. Aggregates for preliminary testing shall be furnished by the Contractor prior to the start of production. All tests for initial aggregate submittals necessary to determine compliance with the specification requirements will be made by the Engineer at no expense to the Contractor.

Samples of aggregates shall be furnished by the Contractor at the start of production and at intervals during production. The sampling points and intervals will be designated by the Engineer. The samples will be the basis of approval of specific lots of aggregates from the standpoint of the quality requirements of this section.

In lieu of testing, the Engineer may accept certified state test results indicating that the aggregate meets specification requirements. Certified test results shall be less than 6 months old.

Samples of aggregates to check gradation shall be taken by the Engineer at least two per lot. The lot will be consistent with acceptable sampling for density. The samples shall be taken from the in-place, compacted material. Sampling shall be in accordance with ASTM D 75, and testing shall be in accordance with ASTM C 136 and ASTM C 117.

b. Gradation Requirements. The gradation (job mix) of the final mixture shall fall within the design range indicated in Table 1, when tested in accordance with ASTM C 117 and ASTM C 136. The final gradation shall be continuously well graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on an adjacent sieve or vice versa.

The maximum percent of material by weight of particles smaller than 0.02 mm shall be 3 percent when tested in accordance with ASTM D 422.

TABLE 1. REQUIREMENTS FOR GRADATION OF AGGREGATE \1

Sieve Size	Design Range Percentage by Weight Percentage by Weight	Job Mix Tolerances Percent
2 in (50.0 mm)	100	0
1-1/2 (37.0 mm)	95-100	+/- 5
1 in (25.0 mm)	70-95	+/- 8
3/4 in (19.0 mm)	55-85	+/- 8
No. 4 (4.75 mm)	30-60	+/- 8
No. 30 (0.60 mm)	12-30	+/- 5
No. 200 (0.075 mm)	0-5	0

The job mix tolerances in Table 1 shall be applied to the job mix gradation to establish a job control grading band. The full tolerance still will apply if application of the tolerances results in a job control grading band outside the design range.

The fraction of the final mixture that passes the No. 200 sieve shall not exceed 60 percent of the fraction passing the No. 30 sieve.

CONSTRUCTION METHODS

209-3.1 PREPARING UNDERLYING COURSE. The underlying course shall be checked and accepted by the Engineer before placing and spreading operations are started. Any ruts or soft yielding places caused by improper drainage conditions, hauling, or any other cause shall be corrected at the Contractor's expense before the base course is placed thereon. Material shall not be placed on frozen subgrade. The sub grade, sub base, backfill or any other material making up the underlying course shall be compacted to at least 100 percent of the maximum density of laboratory specimens prepared from representative samples of the material.

209-3.2 MIXING. The aggregate shall be uniformly blended during crushing operations or mixed in a plant. The plant shall blend and mix the materials to meet the specifications and to secure the proper moisture content for compaction.

209-3.3 PLACING. The crushed aggregate base material shall be placed on the moistened subgrade in layers of uniform thickness with a mechanical spreader.

The maximum depth of a compacted layer shall be 6 inches. If the total depth of the compacted material is more than 6 inches, it shall be constructed in two or more layers. In multi-layer construction, the base course shall be placed in approximately equal-depth layers.

The previously constructed layer should be cleaned of loose and foreign material prior to placing the next layer. The surface of the compacted material shall be kept moist until covered with the next layer.

209-3.4 COMPACTION. Immediately upon completion of the spreading operations, the crushed aggregate shall be thoroughly compacted. The number, type, and weight of rollers shall be sufficient to compact the material to the required density.

The moisture content of the material during placing operations shall not be below, nor more than 2 percentage points above, the optimum moisture content as determined by ASTM D1557. If the material being compacted has more than 30 percent retained on the ¾-inch sieve maximum density shall be determined by AASHTO T-180.

209-3.5 ACCEPTANCE SAMPLING AND TESTING FOR DENSITY. Aggregate base course shall be accepted for density on a lot basis. A lot will consist of one day's production where it is not expected to exceed 2400 square yards. A lot will consist of one-half day's production where a day's production is expected to consist of between 2400 and 4800 square yards.

Each lot shall be divided into two equal sublots. One test shall be made for each subplot. Sampling locations will be determined by the Engineer on a random basis in accordance with statistical procedures contained in ASTM D 3665.

Each lot will be accepted for density when the field density is at least 100 percent of the maximum density of laboratory specimens prepared from samples of the base course material delivered to the job site. The specimens shall be compacted and tested in accordance with ASTM D1557. If the material being compacted has more than 30 percent retained on the ¾-inch sieve the in place density shall be 100 percent of the maximum density as determined by AASHTO T-180. The in-place field density shall be determined in accordance with ASTM D 1556 or D 2167. If the specified density is not attained, the entire lot shall be reworked and/or recompact and two additional random tests made. This procedure shall be followed until the specified density is reached.

In lieu of determining field density by ASTM D 1556 Sand-Cone Method, acceptance testing may be accomplished using a nuclear gage in accordance with the current revision of ASTM D 6938. In the field the gage shall be standardized in accordance with paragraph 9 of ASTM D 6938. Standardizing tests shall be conducted on the first lot of material placed that meets the density requirements. Calibration and Standardization shall be conducted in accordance with ASTM and manufactures standards.

If a nuclear gage is used for density determination, two random readings shall be made for each subplot.

209-3.6 FINISHING. The surface of the aggregate base course shall be finished by blading or with automated equipment especially designed for this purpose.

In no case will the addition of thin layers of material be added to the top layer of base course to meet grade. If the elevation of the top layer is 1/2 inch or more below grade, the top layer of base shall be scarified to a depth of at least 3 inches, new material added, and the layer shall be blended and recompact to bring it to grade. If the finished surface is above plan grade, it shall be cut back to grade and rerolled.

209-3.7 SURFACE TOLERANCES. The finished surface shall not vary more than 3/8 inch when tested with a 16-foot straightedge applied parallel with or at right angles to the centerline. Any deviation in excess of this amount shall be corrected by the Contractor at the Contractor's expense.

209-3.8 THICKNESS CONTROL. The completed thickness of the base course shall be within 1/2 inch of the design thickness. Four determinations of thickness shall be made for each lot of material placed. The lot size shall be consistent with that specified in paragraph 3.5. Each lot shall be divided into four equal sublots. One test shall be made for each subplot. Sampling locations will be determined by the Engineer on a random basis in accordance with procedures contained in ASTM D 3665. Where the thickness is deficient by more than 1/2 inch, the Contractor shall correct such areas at no additional cost by excavating to the required depth and replacing with new material. Additional test holes may be required to identify the limits of deficient areas.

209-3.9 MAINTENANCE. The base course shall be maintained in a condition that will meet all specification requirements until the work is accepted. Equipment used in the construction of an adjoining section may be routed over completed portions of the base course, provided no damage results and provided that the equipment is routed over the full width of the base course to avoid rutting or uneven compaction.

The Contractor shall remove all survey and grade hubs from the base courses prior to placing any bituminous surface course.

METHOD OF MEASUREMENT

209-4.1 The quantity of crushed aggregate base course to be paid for will be determined by measurement of the number of cubic yards of material actually constructed and accepted by the Engineer as complying with the plans and specifications. On individual depth measurements, thicknesses more than 1/2 inch (12 mm) in excess of the design thickness shall be considered as the specified thickness, plus 1/2 inch (12 mm) in computing the number of cubic yards (cubic meters) for payment.

BASIS OF PAYMENT

209-5.1 Payment shall be made at the contract unit price per cubic yard for crushed aggregate base course. This price shall be full compensation for furnishing all materials, for preparing and placing these materials, and for all labor, equipment tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-209-1	Crushed Aggregate Base Course	per Cubic Yard
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TESTING REQUIREMENTS

ASTM C 29	Unit Weight of Aggregate
ASTM C 88	Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C 117	Materials Finer than 75µm (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C 131	Resistance to Degradation of Small-Size Coarse Aggregate by abrasion and impact in the Los Angeles Machine
ASTM C 136	Sieve Analysis of Fine and Coarse Aggregates
ASTM D 75	Sampling Aggregate
ASTM D 422	Particle Size Analysis of Soils
ASTM D 693	Crushed Aggregate for Macadam Pavements
ASTM D 698	Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5.5-lb (2.49-kg) Rammer and 12-in (305mm) Drop
ASTM D 1556	Density of Soil in Place by the Sand-Cone Method
ASTM D 1557	Test for Laboratory Compaction Characteristics of Soil Using Modified Effort
ASTM D 2167	Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D 2419	Sand Equivalent Value of Soils and Fine Aggregate
ASTM D 3665	Random Sampling of Construction Materials
ASTM D 4318	Liquid Limit, Plastic Limit, and Plasticity Index of Soils

ASTM D 6938 Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

AASHTO T 180 Standard Method of Test for Moisture-Density Relations of Soils Using a 10-lb Rammer and a 18-in. Drop

END OF ITEM P-209

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ITEM P- 401
PLANT MIX BITUMINOUS CONCRETE TOP COURSE PAVEMENT

CONTRACT DOCUMENTS

401-0.1 This section of these specifications is a part of the Contract Documents as defined in the Contract Articles. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other sections.

Attention shall be directed to the sections of these specifications entitled, "Summary of Work and Special Work Requirements" and "Supplemental Contract Articles".

DESCRIPTION

401-1.1 This item shall consist of pavement courses composed of mineral aggregate and bituminous material mixed in a central mixing plant and placed on a prepared course in accordance with these specifications and shall conform to the lines, grades, thicknesses, and typical cross sections shown on the plans. Each course shall be constructed to the depth, typical section, and elevation required by the plans and shall be rolled, finished, and approved before the placement of the next course.

MATERIALS

401-2.1 AGGREGATE. Aggregates shall consist of crushed stone, crushed gravel, or crushed slag with or without natural sand or other inert finely divided mineral aggregate. The portion of combined materials retained on the No. 4 (4.75 mm) sieve is coarse aggregate. The portion of combined materials passing the No. 4 (4.75 mm) sieve and retained on the No. 200 (0.075 mm) sieve is fine aggregate, and the portion passing the No. 200 (0.075 mm) sieve is mineral filler.

a. Coarse Aggregate. Coarse aggregate shall consist of sound, tough, durable particles, free from adherent films of matter that would prevent thorough coating and bonding with the bituminous material and be free from organic matter and other deleterious substances. The percentage of wear shall not be greater than 40 percent when tested in accordance with ASTM C 131. The sodium sulfate soundness loss shall not exceed 10 percent, or the magnesium sulfate soundness loss shall not exceed 13 percent, after five cycles, when tested in accordance with ASTM C 88.

Aggregate shall contain at least 70 percent by weight of individual pieces having two or more fractured faces and 85 percent by weight having at least one fractured face. The area of each face shall be equal to at least 75 percent of the smallest midsectional area of the piece. When two fractured faces are contiguous, the angle between the planes of fractures shall be at least 30 degrees to count as two fractured faces. Fractured faces shall be obtained by crushing.

The aggregate shall not contain more than a total of 8 percent, by weight, of flat particles, elongated particles, and flat and elongated particles, when tested in accordance with ASTM D 4791 with a value of 5:1.

Slag shall be air-cooled, blast furnace slag, and shall have a compacted weight of not less than 70 pounds per cubic foot (1.12 mg/cubic meter) when tested in accordance with ASTM C 29.

b. Fine Aggregate. Fine aggregate shall consist of clean, sound, durable, angular shaped particles produced by crushing stone, slag, or gravel that meets the requirements for wear and soundness specified for coarse aggregate. The aggregate particles shall be free from coatings of clay, silt, or other objectionable matter and shall contain no clay balls. The fine aggregate, including any blended material for the fine aggregate, shall have a plasticity index of not more than 6 and a liquid limit of not more than 25 when tested in accordance with ASTM D 4318.

Natural (nonmanufactured) sand may be used to obtain the gradation of the aggregate blend or to improve the workability of the mix. The amount of sand to be added will be adjusted to produce mixtures conforming to requirements of this specification. The fine aggregate shall not contain more than 15 percent natural sand by weight of total aggregates. If used, the natural sand shall meet the requirements of ASTM D 1073 and shall have a plasticity index of not more than 6 and a liquid limit of not more than 25 when tested in accordance with ASTM D 4318.

The aggregate shall have sand equivalent values of 45 or greater when tested in accordance with ASTM D 2419.

c. Sampling. ASTM D 75 shall be used in sampling coarse and fine aggregate, and ASTM C 183 shall be used in sampling mineral filler.

401-2.2 MINERAL FILLER. If filler, in addition to that naturally present in the aggregate, is necessary, it shall meet the requirements of ASTM D 242.

401-2.3 BITUMINOUS MATERIAL. Bituminous material shall conform to the following requirements: AASHTO M320 Performance Grade (PG) 64-28. Test data indicating grade certification shall be provided by the supplier at the time of delivery of each load to the mix plant. Copies of these certifications shall be submitted to the Engineer.

The Contractor shall furnish vendor's certified test reports for each lot of bituminous material shipped to the project. The vendor's certified test report for the bituminous material can be used for acceptance or tested independently by the Engineer.

401-2.4 PRELIMINARY MATERIAL ACCEPTANCE. Prior to delivery of materials to the job site, the Contractor shall submit certified test reports to the Engineer for the following materials:

a. Coarse Aggregate.

- (1) Percent of wear.
- (2) Soundness.
- (3) Unit weight of slag.
- (4) Percent fractured faces.

b. Fine Aggregate.

- (1) Liquid limit.
- (2) Plasticity index.
- (3) Sand equivalent.

c. Mineral Filler.

- d. Bituminous Material.** Test results for bituminous material shall include temperature/viscosity charts for mixing and compaction temperatures.

The certification(s) shall show the appropriate ASTM test(s) for each material, the test results, and a statement that the material meets the specification requirement.

All certifications, test results and statements shall be a maximum of 12 months old at the time of submission.

The Engineer may request samples for testing, prior to and during production, to verify the quality of the materials and to ensure conformance with the applicable specifications.

401-2.5 ANTI-STRIPPING AGENT. Any anti-stripping agent or additive if required shall be heat stable, shall not change the asphalt cement viscosity beyond specifications, shall contain no harmful ingredients, shall be added in recommended proportion by approved method, and shall be a material approved by the Department of Transportation of the State in which the project is located.

COMPOSITION

401-3.1 COMPOSITION OF MIXTURE. The bituminous plant mix shall be composed of a mixture of well-graded aggregate, filler and anti-strip agent if required, and bituminous material. The several aggregate

fractions shall be sized, handled in separate size groups, and combined in such proportions that the resulting mixture meets the grading requirements of the job mix formula (JMF).

401-3.2 JOB MIX FORMULA. No bituminous mixture for payment shall be produced until a job mix formula has been approved in writing by the Engineer. The bituminous mixture shall be designed using procedures contained in Chapter 5, MARSHALL METHOD OF MIX DESIGN, of the Asphalt Institute's Manual Series No. 2 (MS-2), Mix Design Methods for Asphalt Concrete, sixth edition.

The design criteria in Table 1 are target values necessary to meet the acceptance requirements contained in paragraph 401-5.2b. The criteria are based on a production process which has a material variability with the following standard deviations:

Stability (lbs.) = 270
Flow (0.01 inch) = 1.5
Air Voids (%) = 0.65

If material variability exceeds the standard deviations indicated, the job mix formula and subsequent production targets shall be based on a stability greater than shown in Table 1, and the flow and air voids shall be targeted close to the mid-range of the criteria in order to meet the acceptance requirements.

Tensile Strength Ratio (TSR) of the composite mixture, as determined by ASTM D 4867, shall not be less than 80. Anti-stripping agent shall be added to the asphalt, as necessary, to produce a TSR of not less than 80. If an antistrip agent is required, it will be provided by the Contractor at no additional cost to the Owner.

The job mix formula shall be submitted in writing by the Contractor to the Engineer at least 14 days prior to the start of paving operations and shall include as a minimum:

- a. Percent passing each sieve size for total combined gradation, individual gradation of all aggregate stockpiles and percent by weight of each stockpile used in the job mix formula.
- b. Percent of asphalt cement.
- c. Asphalt performance, viscosity or penetration grade, and type of modifier if used.
- d. Number of blows of hammer compaction per side of molded specimen.
- e. Mixing temperature.
- f. Compaction temperature.
- g. Temperature of mix when discharged from the mixer.
- h. Temperature-viscosity relationship of the asphalt cement.
- i. Plot of the combined gradation on the Federal Highway Administration (FHWA) 45 power gradation curve.
- j. Graphical plots of stability, flow, air voids, voids in the mineral aggregate, and unit weight versus asphalt content.
- k. Percent natural sand.
- l. Percent fractured faces.
- m. Percent by weight of flat particles, elongated particles, and flat and elongated particles (and criteria).
- n. Tensile Strength Ratio (TSR).

- o. Antistrip agent (if required).
- p. Date the job mix formula was developed.

The Contractor shall submit to the Engineer the results of verification testing of three (3) asphalt samples prepared at the optimum asphalt content. The average of the results of this testing shall indicate conformance with the job mix formula requirements specified in Tables 1, 2 and 3. *These test results shall be a maximum of 12 months old at the time of submission.*

When the project requires asphalt mixtures of differing aggregate gradations, a separate job mix formula and the results of job mix formula verification testing must be submitted for each mix.

The job mix formula for each mixture shall be in effect until a modification is approved in writing by the Engineer. Should a change in sources of materials be made, a new job mix formula must be submitted within 10 days and approved by the Engineer in writing before the new material is used. After the initial production job mix formula(s) has/have been approved by the Engineer and a new or modified job mix formula is required for whatever reason, the subsequent cost of the Engineer's approval of the new or modified job mix formula will be borne by the Contractor. There will be no time extension given or considerations for extra costs associated with the stoppage of production paving or restart of production paving due to the time needed for the Engineer to approve the initial, new or modified job mix formula.

TABLE 1. MARSHALL DESIGN CRITERIA

TEST PROPERTY	*
Number of blows	75
Stability, pounds minimum	2150
Flow, 0.01 in.	10-14
Air voids (percent)	2.8-4.2
Percent voids in mineral aggregate, minimum	See Table 2

TABLE 2. MINIMUM PERCENT VOIDS IN MINERAL AGGREGATE

Maximum Particle Size		Minimum Voids in Mineral Aggregate, percent
in.	mm	Percent
½	12.5	16
¾	19.0	15
1	25.0	14
1-½	37.5	13

The mineral aggregate shall be of such size that the percentage composition by weight, as determined by laboratory sieves, will conform to the gradation or gradations specified in Table 3 when tested in accordance with ASTM C 136 and C 117.

The gradations in Table 3 represent the limits that shall determine the suitability of aggregate for use from the sources of supply. The aggregate, as selected (and used in the JMF), shall have a gradation within the limits designated in Table 3 and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve, or vice versa, but shall be well graded from coarse to fine.

Deviations from the final approved mix design for bitumen content and gradation of aggregates shall be within the action limits for individual measurements as specified in paragraph 401-6.5a. The limits still will apply if they fall outside the master grading band in Table 3.

The maximum size aggregate used shall not be more than one-half of the thickness of the course being constructed except where otherwise shown on the plans or ordered by the Engineer.

TABLE 3. AGGREGATE - BITUMINOUS PAVEMENTS

Sieve Size	Percentage by Weight Passing Sieve
1-½ in. (37.50 mm)	100
1 in. (25.0 mm)	100
¾ in. (19.0 mm)	76-98
½ in. (12.5 mm)	66-86
⅜ in. (9.5 mm)	57-77
No. 4 (4.75 mm)	40-60
No. 8 (2.36 mm)	26-46
No. 16 (1.18 mm)	17-37
No. 30 (0.60 mm)	11-27
No. 50 (0.30 mm)	7-19
No. 100 (0.15 mm)	6-16
No. 200 (0.075 mm)	3-6
Asphalt percent	
Stone or gravel	4.5-7.0
Slag	5.0-7.5

The aggregate gradations shown are based on aggregates of uniform specific gravity. The percentages passing the various sieves shall be corrected when aggregates of varying specific gravities are used, as indicated in the Asphalt Institute Manual Series No. 2 (MS-2), Chapter 3.

401-3.3 RECYCLED ASPHALT CONCRETE. The use of recycled HMA will not be allowed for this project.

401-3.4 TEST SECTION. Prior to full production, the Contractor shall prepare and place a quantity of bituminous mixture according to the job mix formula. The amount of mixture shall be sufficient to construct a test section 300 long and 20 wide, placed in two lanes, with a longitudinal cold joint, and shall be of the same depth specified for the construction of the course which it represents. A cold joint is an exposed construction joint at least 4 hours old or whose mat has cooled to less than 160° F. The underlying grade or pavement structure upon which the test section is to be constructed shall be the same as the remainder of the course represented by the test section. The equipment used in construction of the test section shall be the same type and weight to be used on the remainder of the course represented by the test section.

THE TEST SECTION SHALL BE EVALUATED FOR ACCEPTANCE AS A SINGLE LOT IN ACCORDANCE WITH THE ACCEPTANCE CRITERIA IN PARAGRAPH 401-5.1 AND 401-6.3. THE TEST SECTION SHALL BE DIVIDED INTO EQUAL SUBLOTS. AS A MINIMUM THE TEST SECTION SHALL CONSIST OF 3 SUBLOTS.

The test section shall be considered acceptable if; 1) stability, flow, mat density, air voids, and joint density are 90 percent or more within limits, 2) gradation and asphalt content are within the action limits specified in paragraphs 401-6.5a and 5b, and 3) the voids in the mineral aggregate are within the limits of Table 2.

If the initial test section should prove to be unacceptable, the necessary adjustments to the job mix formula, plant operation, placing procedures, and/or rolling procedures shall be made. A second test section shall then be placed. If the second test section also does not meet specification requirements, both sections shall be removed at the Contractor's expense. Additional test sections, as required, shall be constructed and evaluated for conformance to the specifications. Any additional sections that are not acceptable shall be removed at the Contractor's expense. Full production shall not begin until an acceptable section has been constructed and accepted in writing by the

Engineer. Once an acceptable test section has been placed, payment for the initial test section and the section that meets specification requirements shall be made in accordance with paragraph 401-8.1.

Job mix control testing shall be performed by the Contractor at the start of plant production and in conjunction with the calibration of the plant for the job mix formula. If aggregates produced by the plant do not satisfy the gradation requirements or produce a mix that meets the JMF. It will be necessary to reevaluate and redesign the mix using plant-produced aggregates. Specimens shall be prepared and the optimum bitumen content determined in the same manner as for the original design tests.

Contractor will not be allowed to place the test section until the Contractor Quality Control Program, showing conformance with the requirements of Paragraph 401-6.1, has been approved, in writing, by the Engineer.

401-3.5 JOB MIX FORMULA (JMF) LABORATORY. The Contractor's laboratory used to develop the job mix formula shall meet the requirements of ASTM D 3666. The laboratory accreditation must be current and listed on the accrediting authority's website. All test methods required for developing the JMF must be listed on the lab accreditation. A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the Engineer prior to start of construction.

CONSTRUCTION METHODS

401-4.1 WEATHER LIMITATIONS. The bituminous mixture shall not be placed upon a wet surface or when the surface temperature of the underlying course is less than specified in Table 4. The temperature requirements may be waived by the Engineer, if requested; however, all other requirements including compaction shall be met.

TABLE 4. BASE TEMPERATURE LIMITATIONS

Mat Thickness	Base Temperature (Minimum)	
	Deg. F	Deg. C
3 in. (7.5 cm) or greater	40	4
Greater than 1 in. (2.5 cm) but less than 3 in. (7.5 cm)	45	7
1 in. (2.5 cm) or less	50	10

401-4.2 BITUMINOUS MIXING PLANT. Plants used for the preparation of bituminous mixtures shall conform to the requirements of ASTM D 995 with the following changes:

a. Requirements for All Plants.

(1) Truck Scales. The bituminous mixture shall be weighed on approved scales furnished by the Contractor, or on certified public scales at the Contractor's expense. Scales shall be inspected and sealed as often as the Engineer deems necessary to assure their accuracy. Scales shall conform to the requirements of the General Provisions, Section 90-01.

In lieu of scales, and as approved by the Engineer, asphalt mixture weights may be determined by the use of an electronic weighing system equipped with an automatic printer that weighs the total paving mixture. Contractor must furnish calibration certification of the weighing system prior to mix production and as often thereafter as requested by the Engineer.

(2) Testing Facilities. The Contractor shall provide laboratory facilities at the plant for the use of the Engineer's acceptance testing and the Contractor's quality control testing. The Engineer will always have priority in the use of the laboratory. The lab shall have sufficient space and equipment so that both testing representatives (Engineer's and Contractor's) can operate efficiently. The lab shall also meet the requirements of ASTM D 3666.

The plant testing laboratory shall have a floor space area of not less than 150 square feet, with a ceiling height of not less than 7-½ feet. The laboratory shall be weather tight, sufficiently heated in cold weather, air-conditioned in hot

weather to maintain temperatures for testing purposes of 70 degrees F +/- 5 degrees F. The plant testing laboratory shall be located on the plant site to provide an unobstructed view, from one of its windows, of the trucks being loaded with the plant mix materials.

Laboratory facilities shall be kept clean, and all equipment shall be maintained in proper working condition. The Engineer shall be permitted unrestricted access to inspect the Contractor's laboratory facility and witness quality control activities. The Engineer will advise the Contractor in writing of any noted deficiencies concerning the laboratory facility, equipment, supplies, or testing personnel and procedures. When the deficiencies are serious enough to be adversely affecting the test results, the incorporation of the materials into the work shall be suspended immediately and will not be permitted to resume until the deficiencies are satisfactorily corrected.

As a minimum, the plant testing laboratory shall have:

- (a) Adequate artificial lighting
- (b) Electrical outlets sufficient in number and capacity for operating the required testing equipment and drying samples.
- (c) Fire extinguishers (2), Underwriter's Laboratories approved
- (d) Work benches for testing, minimum 2-½ feet by 10 feet.
- (e) Desk with 2 chairs
- (f) Sanitary facilities convenient to testing laboratory
- (g) Exhaust fan to outside air, minimum 12 inch blade diameter
- (h) A direct telephone line and telephone including a FAX machine operating 24 hours per day, seven days per week
- (i) File cabinet with lock for Engineer
- (j) Sink with running water, attached drain board and drain capable of handling separate material
- (k) Metal stand for holding washing sieves
- (l) Two element hot plate or other comparable heating device, with dial type thermostatic controls for drying aggregates
- (m) Mechanical shaker and appropriate sieves (listed in JMF, Table 3) meeting the requirements of ASTM E-11 for determining the gradation of coarse and fine aggregates in accordance with ASTM C 136
- (n) Marshall testing equipment meeting ASTM D 6926, ASTM D 6927, automatic compaction equipment capable of compacting three specimens at once and other apparatus as specified in ASTM C 127, D 2172, D 2726, and D 2041
- (o) Oven, thermostatically controlled, inside minimum 1 cubic foot
- (p) Two volumetric specific gravity flasks, 500 cc
- (q) Other necessary hand tools required for sampling and testing
- (r) Library containing contract specifications, latest ASTM volumes 4.01, 4.02, 4.03 and 4.09, AASHTO standard specification parts I and II, and Asphalt Institute Publication MS-2.
- (s) Equipment for Theoretical Specific Gravity testing including a 4,000 cc pycnometer, vacuum pump capable of maintaining 30 ml mercury pressure and a balance, 16-20 kilograms with accuracy of 0.5 grams
- (t) Extraction equipment, centrifuge and reflux types and ROTOflex equipment
- (u) A masonry saw with diamond blade for trimming pavement cores and samples
- (v) Telephone

Approval of the plant and testing laboratory by the Engineer requires all facilities and equipment to be in good working order during production, sampling and testing. Failure to provide the specified facilities shall be sufficient cause for disapproving bituminous plant operations.

The Owner shall have access to the lab and the plant whenever Contractor is in production.

(3) Inspection of Plant. The Engineer, or Engineer's authorized representative, shall have access, at all times, to all areas of the plant for checking adequacy of equipment; inspecting operation of the plant: verifying

weights, proportions, and material properties; and checking the temperatures maintained in the preparation of the mixtures.

(4) Storage Bins and Surge Bins. Use of surge and storage bins for temporary storage of hot bituminous mixtures will be permitted as follows:

- (a) The bituminous mixture may be stored in surge bins for *a* period of time not to exceed 3 hours.
- (b) The bituminous mixture may be stored in insulated storage bins for a period of time not to exceed 24 hours.

The bins shall be such that mix drawn from them meets the same requirements as mix loaded directly into trucks.

If the Engineer determines that there is an excessive amount of heat loss, segregation, or oxidation of the mixture due to temporary storage, no temporary storage will be allowed.

401-4.3 HAULING EQUIPMENT. Trucks used for hauling bituminous mixtures shall have tight, clean, and smooth metal beds. To prevent the mixture from adhering to them, the truck beds shall be lightly coated with a minimum amount of paraffin oil, lime solution, or other approved material. Petroleum products shall not be used for coating truck beds. Each truck shall have a suitable cover to protect the mixture from adverse weather. When necessary, to ensure that the mixture will be delivered to the site at the specified temperature, truck beds shall be insulated or heated and covers shall be securely fastened.

401-4.4 BITUMINOUS PAVERS. Bituminous pavers shall be self-propelled with an activated heated screed, capable of spreading and finishing courses of bituminous plant mix material that will meet the specified thickness, smoothness, and grade. The paver shall have sufficient power to propel itself and the hauling equipment without adversely affecting the finished surface.

The paver shall have a receiving hopper of sufficient capacity to permit a uniform spreading operation. The hopper shall be equipped with a distribution system to place the mixture uniformly in front of the screed without segregation. The screed shall effectively produce a finished surface of the required evenness and texture without tearing, shoving, or gouging the mixture.

The paver shall be equipped with a control system capable of automatically maintaining the specified screed elevation. The control system shall be automatically actuated from either a reference line and/or through a system of mechanical sensors or sensor-directed mechanisms or devices that will maintain the paver screed at a predetermined transverse slope and at the proper elevation to obtain the required surface. The transverse slope controller shall be capable of maintaining the screed at the desired slope within plus or minus 0.1 percent.

The controls shall be capable of working in conjunction with any of the following attachments:

- a. Ski-type device of not less than 30 feet (9.14 m) in length.
- b. Taut stringline (wire) set to grade.
- c. Short ski or shoe.
- d. Laser control.

If, during construction, it is found that the spreading and finishing equipment in use leaves tracks or indented areas, or produces other blemishes in the pavement that are not satisfactorily corrected by the scheduled operations, the use of such equipment shall be discontinued and satisfactory equipment shall be provided by the Contractor.

401-4.5 ROLLERS. Rollers of the vibratory, steel wheel, and pneumatic-tired type shall be used. They shall be in good condition, capable of operating at slow speeds to avoid displacement of the bituminous mixture. The

number, type, and weight of rollers shall be sufficient to compact the mixture to the required density while it is still in a workable condition.

All rollers shall be specifically designed and suitable for compacting hot mix bituminous concrete and shall be properly used. Rollers that impair the stability of any layer of a pavement structure or underlying soils shall not be used. Depressions in pavement surfaces caused by rollers shall be repaired by the Contractor at its own expense.

The use of equipment that causes crushing of the aggregate will not be permitted.

- a. **Nuclear Densometer.** The Contractor shall have on site a nuclear densometer during all paving operations in order to assist in the determination of the optimum rolling pattern, type of roller and frequencies, as well as to monitor the effect of the rolling operations during production paving. The Contractor shall also supply a qualified technician during all paving operations to calibrate the nuclear densometer and obtain accurate density readings for all new bituminous concrete. These densities shall be supplied to the Engineer upon request at any time during construction. No separate payment will be made for supplying the density gauge and technician.

401-4.6 PREPARATION OF BITUMINOUS MATERIAL. The bituminous material shall be heated in a manner that will avoid local overheating and provide a continuous supply of the bituminous material to the mixer at a uniform temperature. The temperature of the bituminous material delivered to the mixer shall be sufficient to provide a suitable viscosity for adequate coating of the aggregate particles, but shall not exceed 325 degrees F (160 degrees C), unless otherwise required by the manufacturer.

401-4.7 PREPARATION OF MINERAL AGGREGATE. The aggregate for the mixture shall be heated and dried prior to introduction into the mixer. The maximum temperature and rate of heating shall be such that no damage occurs to the aggregates. The temperature of the aggregate and mineral filler shall not exceed 350 degrees F (175 degrees C) when the asphalt is added. Particular care shall be taken that aggregates high in calcium or magnesium content are not damaged by overheating. The temperature shall not be lower than is required to obtain complete coating and uniform distribution on the aggregate particles and to provide a mixture of satisfactory workability.

401-4.8 PREPARATION OF BITUMINOUS MIXTURE. The aggregates and the bituminous material shall be weighed or metered and introduced into the mixer in the amount specified by the job mix formula.

The combined materials shall be mixed until the aggregate obtains a uniform coating of bitumen and is thoroughly distributed throughout the mixture. Wet mixing time shall be the shortest time that will produce a satisfactory mixture, but not less than 25 seconds for batch plants. The wet mixing time for all plants shall be established by the Contractor, based on the procedure for determining the percentage of coated particles described in ASTM D 2489, for each individual plant and for each type of aggregate used. The wet mixing time will be set to achieve 95 percent of coated particles. For continuous mix plants, the minimum mixing time shall be determined by dividing the weight of its contents at operating level by the weight of the mixture delivered per second by the mixer. The moisture content of all bituminous mixtures upon discharge shall not exceed 0.5 percent.

401-4.9 PREPARATION OF THE UNDERLYING SURFACE. Immediately before placing the bituminous mixture, the underlying course shall be cleaned of all dust and debris. A prime coat or tack coat shall be applied in accordance with Item P-602 or P-603, if shown on the plans.

401-4.10 LAYDOWN PLAN, TRANSPORTING, PLACING, AND FINISHING. Prior to the placement of the bituminous mixture, the Contractor shall prepare a laydown plan for approval by the Engineer. This is to minimize the number of cold joints in the pavement. The laydown plan shall include the sequence of paving laydown by stations, width of lanes, temporary ramp location(s), and laydown temperature. The laydown plan shall also include estimated time of completion for each portion of the work (i.e. milling, paving, rolling, cooling, etc.). Modifications to the laydown plan shall be approved by the Engineer.

The bituminous mixture shall be transported from the mixing plant to the site in vehicles conforming to the requirements of paragraph 401-4.3. Deliveries shall be scheduled so that placing and compacting of mixture is

uniform with minimum stopping and starting of the paver. Hauling over freshly placed material shall not be permitted until the material has been compacted, as specified, and allowed to cool to atmospheric temperature.

Paving during nighttime construction shall require the following:

- a. All paving machines, rollers, distribution trucks and other vehicles required by the Contractor for his operations shall be equipped with artificial illumination sufficient to safely complete the work.
- b. Minimum illumination level shall be twenty (20) horizontal foot candles and maintained in the following areas:

(1) An area of 30 feet wide by 30 feet long immediately behind the paving machines during the operations of the machines.

(2) An area 15 feet wide by 30 feet long immediately in front and back of all rolling equipment, during operation of the equipment.

(3) An area 15 feet wide by 15 feet long at any point where an area is being tack coated prior to the placement of pavement.

- c. As partial fulfillment of the above requirements, the Contractor shall furnish and use, complete artificial lighting units with a minimum capacity of 3,000 watt electric beam lights, affixed to all equipment in such a way to direct illumination on the area under construction.
- d. In addition, the Contractor shall furnish a sufficient number of portable floodlight units to adequately illuminate the work area. The number of portable floodlight units shall be subject to the approval of the engineer.

The initial placement and compaction of the mixture shall occur at a temperature suitable for obtaining density, surface smoothness, and other specified requirements but not less than 250 degrees F.

Edges of existing bituminous pavement abutting the new work shall be saw cut and carefully removed as shown on the drawings and painted with bituminous tack coat before new material is placed against it.

Upon arrival, the mixture shall be placed to the full width by a bituminous paver. It shall be struck off in a uniform layer of such depth that, when the work is completed, it shall have the required thickness and conform to the grade and contour indicated. The speed of the paver shall be regulated to eliminate pulling and tearing of the bituminous mat. Unless otherwise permitted, placement of the mixture shall begin along the centerline of a crowned section or on the high side of areas with a one-way slope. The mixture shall be placed in consecutive adjacent strips having a minimum width of 10 feet except where edge lanes require less width to complete the area. Additional screed sections shall not be attached to widen paver to meet the minimum lane width requirements specified above unless additional auger sections are added to match. The longitudinal joint in one course shall offset the longitudinal joint in the course immediately below by at least 1 foot; however, the joint in the surface top course shall be at the centerline of crowned pavements. Transverse joints in one course shall be offset by at least 10 feet (3 m) from transverse joints in the previous course.

Transverse joints in adjacent lanes shall be offset a minimum of 10 feet.

On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impractical, the mixture may be spread and luted by hand tools. Areas of segregation in the surface course, as determined by the Engineer, shall be removed and replaced at the Contractor's expense. The area shall be removed by saw cutting and milling a minimum of 2 inches deep. The area to be removed and replaced shall be a minimum width of the paver and a minimum of 10 feet long.

401-4.11 COMPACTION OF MIXTURE. After placing, the mixture shall be thoroughly and uniformly compacted by power rollers. The surface shall be compacted as soon as possible when the mixture has attained

sufficient stability so that the rolling does not cause undue displacement, cracking or shoving. The sequence of rolling operations and the type of rollers used shall be at the discretion of the Contractor. The speed of the roller shall, at all times, be sufficiently slow to avoid displacement of the hot mixture and be effective in compaction. Any displacement occurring as a result of reversing the direction of the roller, or from any other cause, shall be corrected at once.

Sufficient rollers shall be furnished to handle the output of the plant. Rolling shall continue until the surface is of uniform texture, true to grade and cross section, and the required field density is obtained.

To prevent adhesion of the mixture to the roller, the wheels shall be equipped with a scraper and kept properly moistened but excessive water will not be permitted.

In areas not accessible to the roller, the mixture shall be thoroughly compacted with approved power driven tampers. Tampers shall weigh not less than 275 pounds, have a tamping plate width not less than 15 inches, be rated at not less than 4,200 vibrations per minute, and be suitably equipped with a standard tamping plate wetting device.

Any mixture that becomes loose and broken, mixed with dirt, contains check-cracking, or in any way defective shall be removed and replaced with fresh hot mixture and immediately compacted to conform to the surrounding area. This work shall be done at the Contractor's expense. Skin patching shall not be allowed.

401-4.12 JOINTS. The formation of all joints shall be made in such a manner as to ensure a continuous bond between the courses and obtain the required density. All joints shall have the same texture as other sections of the course and meet the requirements for smoothness and grade.

The roller shall not pass over the unprotected end of the freshly laid mixture except when necessary to form a transverse joint. When necessary to form a transverse joint, it shall be made by means of placing a bulkhead or by tapering the course. The tapered edge shall be cut back to its full depth and width on a straight line to expose a vertical face prior to placing the adjacent lane. In both methods, all contact surfaces shall be given a tack coat of bituminous material before placing any fresh mixture against the joint.

Longitudinal joints which are irregular, damaged, uncompacted, or otherwise defective or which have been left exposed for more than 4 hours, or whose surface temperature has cooled to less than 160° F shall be cut back a sufficient distance to expose a clean, sound surface for the full depth of the course. The cutback should be no more than 6 inches. All contact surfaces shall be cleaned and dry prior and given a tack coat of bituminous material prior to placing any fresh mixture against the joint. The cost of this work and tack coat shall be considered incidental to the cost of the bituminous course.

401-4.13 SKID RESISTANT SURFACES/SAW-CUT GROOVING. If shown on the plans, skid resistant surfaces for asphalt pavements shall be provided by construction of saw-cut grooves. Saw-cut grooves must meet the requirements of Item P-621.

MATERIAL ACCEPTANCE

401-5.1 ACCEPTANCE SAMPLING AND TESTING. Unless otherwise specified, all acceptance sampling and testing necessary to determine conformance with the requirements specified in this section will be performed by the Engineer at no cost to the Contractor except that coring as required in this section shall be completed and paid for by the Contractor. Testing organizations performing these tests shall meet the requirements of ASTM D 3666. The laboratory accreditation must be current and listed on the accrediting authority's website. All test methods required for acceptance sampling and testing must be listed on the lab accreditation. A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the Engineer prior to start of construction. All equipment in Contractor furnished laboratories shall be calibrated by an independent testing organization prior to the start of operations at the Contractor's expense.

- a. Plant-Produced Material.** Plant-produced material shall be tested for stability, flow, and air voids on a lot basis. Sampling shall be from material deposited into trucks at the plant or from trucks at the job site. Samples shall be taken in accordance with ASTM D 979. A lot will consist of:

- one day or shift's production not to exceed 2,000 tons, or
- a half day or shift's production where a day's production is expected to consist of between 2,000 and 4,000 tons, or
- similar subdivisions for tonnages over 4,000 tons.

Where more than one plant is simultaneously producing material for the job, the lot sizes shall apply separately for each plant.

(1) Sampling. Each lot will consist of four equal sublots. Sufficient material for preparation of test specimens for all testing will be sampled by the Engineer on a random basis, in accordance with the procedures contained in ASTM D 3665. One set of laboratory compacted specimens will be prepared for each subplot in accordance with ASTM D 6926, at the number of blows required by paragraph 401-3.2, Table 1. Each set of laboratory compacted specimens will consist of three test portions prepared from the same sample increment.

The sample of bituminous mixture may be put in a covered metal tin and placed in an oven for not less than 30 minutes nor more than 60 minutes to stabilize to compaction temperature. The compaction temperature of the specimens shall be as specified in the job mix formula.

(2) Testing. Sample specimens shall be tested for stability and flow in accordance with ASTM D 6927. Air voids will be determined by the Engineer in accordance with ASTM D 3203.

Prior to testing, the bulk specific gravity of each test specimen shall be measured by the Engineer in accordance with ASTM D 2726 using the procedure for laboratory-prepared thoroughly dry specimens, or ASTM D 1188, whichever is applicable, for use in computing air voids and pavement density.

For air voids determination, the theoretical maximum specific gravity of the mixture shall be measured one time for each subplot in accordance with ASTM D 2041, Type C, D or E container. The value used in the air voids computation for each subplot shall be based on theoretical maximum specific gravity measurement for the subplot.

The stability and flow for each subplot shall be computed by averaging the results of all test specimens representing that subplot.

(3) Acceptance. Acceptance of plant produced material for stability, flow, and air voids shall be determined by the Engineer in accordance with the requirements of paragraph 401-5.2b.

b. Field Placed Material. Material placed in the field shall be tested for mat and joint density on a lot basis.

(1) Mat Density. The lot size shall be the same as that indicated in paragraph 401-5.1a and shall be divided into four equal sublots. One core of finished, compacted materials shall be taken by the Contractor from each subplot. Core locations will be determined by the Engineer on a random basis in accordance with procedures contained in ASTM D 3665. Cores shall not be taken closer than one foot from a transverse or longitudinal joint.

(2) Joint Density. The lot size shall be the total length of longitudinal joints constructed by a lot of material as defined in paragraph 401-5.1a. The lot shall be divided into four equal sublots. One core of finished, compacted materials shall be taken by the Contractor from each subplot. Core locations will be determined by the Engineer on a random basis in accordance with procedures contained in ASTM D 3665. ALL CORING SHALL BE CENTERED ON THE JOINT. THE MINIMUM CORE DIAMETER FOR JOINT DENSITY DETERMINATION SHALL BE 5 INCHES.

(3) Sampling. Samples shall be neatly cut with a core drill. The cutting edge of the core drill bit shall be of hardened steel or other suitable material with diamond chips embedded in the metal cutting edge. The minimum diameter of the sample shall be five inches. Samples that are clearly defective, as a result of sampling, shall be discarded and another sample taken. The Contractor shall furnish all tools, labor, and materials for cutting

samples, cleaning, and filling the cored pavement. Cored pavement shall be cleaned and core holes shall be filled in a manner acceptable to the Engineer and within one day after sampling.

(4) Testing. The bulk specific gravity of each cored sample will be measured by the Engineer in accordance with ASTM D 2726 or ASTM D 1188, whichever is applicable. The percent compaction (density) of each sample will be determined by dividing the bulk specific gravity of each subplot sample by the average bulk specific gravity of all laboratory prepared specimens for the lot, as determined in paragraph 401-5.1a(2). The bulk specific gravity used to determine the joint density at joints formed between different lots shall be the lowest of the bulk specific gravity values from the two different lots.

(5) Acceptance. Acceptance of field placed material for mat density will be determined by the Engineer in accordance with the requirements of paragraph 401-5.2b(1). Acceptance for joint density will be determined in accordance with the requirements of paragraph 401-5.2b(3).

c. Partial Lots — Plant-Produced Material. When operational conditions cause a lot to be terminated before the specified number of tests have been made for the lot, or when the Contractor and Engineer agree in writing to allow overages or other minor tonnage placements to be considered as partial lots, the following procedure will be used to adjust the lot size and the number of tests for the lot.

The last batch produced where production is halted will be sampled, and its properties shall be considered as representative of the particular subplot from which it was taken. In addition, an agreed to minor placement will be sampled, and its properties shall be considered as representative of the particular subplot from which it was taken. Where three sublots are produced, they shall constitute a lot. Where one or two sublots are produced, they shall be incorporated into the next lot, and the total number of sublots shall be used in the acceptance plan calculation, i.e., $n = 5$ or $n = 6$, for example. Partial lots at the end of asphalt production on the project shall be included with the previous lot.

d. Partial Lots — Field Placed Material. The lot size for field placed material shall correspond to that of the plant material, except that, in no cases, shall less than three (3) cored samples be obtained, i.e., $n = 3$.

401-5.2 ACCEPTANCE CRITERIA.

a. General. Acceptance will be based on the following characteristics of the bituminous mixture and completed pavement as well as the implementation of the Contractor Quality Control Program and test results:

- (1) Stability
- (2) Flow
- (3) Air voids
- (4) Mat density
- (5) Joint density
- (6) Thickness
- (7) Smoothness
- (8) Grade

Mat density and air voids will be evaluated for acceptance in accordance with paragraph 401-5.2b(1). Stability and flow will be evaluated for acceptance in accordance with paragraph 401-5.2b(2). Joint density will be evaluated for acceptance in accordance with paragraph 401-5.2b(3).

Thickness will be evaluated by the Engineer for compliance in accordance with paragraph 401-5.2b(4). Acceptance for smoothness will be based on the criteria contained in paragraph 401-5.2b(5). Acceptance for grade will be based on the criteria contained in paragraph 401-5.2b(6).

The Engineer may at any time, notwithstanding previous plant acceptance, reject and require the Contractor to dispose of any batch of bituminous mixture which is rendered unfit for use due to contamination, segregation, incomplete coating of aggregate, or improper mix temperature. Such rejection may be based on only visual inspection or temperature measurements. In the event of such rejection, the Contractor may take a representative

sample of the rejected material in the presence of the Engineer, and if it can be demonstrated in the laboratory, in the presence of the Engineer, that such material was erroneously rejected, payment will be made for the material at the contract unit price.

b. Acceptance Criteria.

(1) Mat Density and Air Voids. Acceptance of each lot of plant produced material for mat density and air voids shall be based on the percentage of material within specification limits (PWL). If the PWL of the lot equals or exceeds 90 percent, the lot shall be acceptable. Acceptance and payment shall be determined in accordance with paragraph 401-8.1.

(2) Stability and Flow. Acceptance of each lot of plant produced material for stability and flow shall be based on the percentage of material within specification limits (PWL). If the PWL of the lot equals or exceeds 90 percent, the lot shall be acceptable. If the PWL is less than 90 percent, the Contractor shall determine the reason and take corrective action. If the PWL is below 80 percent, the Contractor must stop production until the reason for poor stability and/or flow has been determined and adjustments to the mix are made

(3) Joint Density. Acceptance of each lot of plant produced material for joint density shall be based on the percentage of material within specification limits (PWL). If the PWL of the lot is equal to or exceeds 90 percent, the lot shall be considered acceptable. If the PWL is less than 90 percent, the Contractor shall evaluate the reason and act accordingly. If the PWL is less than 80 percent, the Contractor shall cease operations and until the reason for poor compaction has been determined. IF THE PWL IS LESS THAN 71 PERCENT, THE PAY FACTOR FOR THE LOT USED TO COMPLETE THE JOINT SHALL BE REDUCED BY 5 PERCENTAGE POINTS. This lot pay factor reduction shall be incorporated and evaluated in accordance with paragraph 401-8.1.

(4) Thickness. Thickness of each lift of surface course shall be evaluated by the Engineer for compliance to the requirements shown on the plans. Measurements of thickness shall be made by the Engineer using the cores extracted for each subplot for density measurement. The maximum allowable deficiency at any point shall not be more than ¼ inch less than the thickness indicated for the lift. Average thickness of lift, or combined lifts, shall not be less than the indicated thickness. Where the thickness tolerances are not met, the lot or subplot shall be corrected by the Contractor at his expense by removing the deficient area and replacing with new pavement. The Contractor, at his expense, may take additional cores as approved by the Engineer to circumscribe the deficient area.

(5) Smoothness. The final surface shall be free from roller marks. The finished surfaces of each course of the pavement, except the finished surface of the final course, shall not vary more than ⅜ inch when evaluated with a 16 foot straightedge. The finished surface of the final course of pavement shall not vary more than ¼ inch when evaluated with a 16 foot straightedge. The lot size shall be 2,000 square yards. Smoothness measurements shall be made at 50 foot intervals and as determined by the Engineer. In the longitudinal direction, a smoothness reading shall be made at the center of each paving lane. In the transverse direction, smoothness readings shall be made continuously across the full width of the pavement. However, transverse smoothness readings shall not be made across designed grade changes. At warped transition areas, straightedge position shall be adjusted to measure surface smoothness and not design grade transitions. When more than 15 percent of all measurements within a lot exceed the specified tolerance, the Contractor shall remove the deficient area to the depth of the final course of pavement and replace with new material. Skin patching shall not be permitted. Isolated high points may be ground off providing the course thickness complies with the thickness specified on the plans. High point grinding will be limited to 15 square yards. Areas in excess of 15 square yards will require removal and replacement of the pavement in accordance with the limitations noted above.

(6) Grade. The finished surface of the pavement shall not vary from the gradeline elevations and cross sections shown on the plans by more than ½ inch (12.70 mm). The finished grade of each lot will be determined by running levels at intervals of 50 feet (15.2 m) or less longitudinally and all breaks in grade transversely (not to exceed 50 feet) to determine the elevation of the completed pavement. The Contractor shall pay the cost of surveying of the level runs that shall be performed by a licensed surveyor. The documentation, stamped and signed by a licensed surveyor, shall be provided by the Contractor to the Engineer. The lot size shall be 2,000 square yards. When more than 15 percent of all the measurements within a lot are outside the specified tolerance, or if any one shot within the lot deviates ¾ inch or more from planned grade, the Contractor shall remove the deficient

area to the depth of the final course of pavement and replace with new material. Skin patching shall not be permitted. Isolated high points may be ground off providing the course thickness complies with the thickness specified on the plans. The surface of the ground pavement shall have a texture consisting of grooves between 0.090 and 0.130 inches wide. The peaks and ridges shall be approximately 1/32 inch higher than the bottom of the grooves. The pavement shall be left in a clean condition. The removal of all of the slurry resulting from the grinding operation shall be continuous. The grinding operation should be controlled so the residue from the operation does not flow across other lanes of pavement. High point grinding will be limited to 15 square yards. Areas in excess of 15 square yards will require removal and replacement of the pavement in accordance with the limitations noted above.

c. Percentage of Material Within Specification Limits (PWL). The percentage of material within specification limits (PWL) shall be determined in accordance with procedures specified in Section 110 of the General Provisions. The specification tolerance limits (L) for lower and (U) for upper are contained in Table 5.

d. Outliers. All individual tests for mat density and air voids shall be checked for outliers (test criterion) in accordance with ASTM E 178, at a significance level of 5 percent. Outliers shall be discarded, and the PWL shall be determined using the remaining test values.

TABLE 5. MARSHALL ACCEPTANCE LIMITS FOR STABILITY, FLOW, AIR VOIDS, DENSITY

<i>TEST PROPERTY</i>	Pavements Designed for Aircraft Gross Weights of 60,000 Lbs. or More or Tire Pressures of 100 Psi or More	
Number of Blows	75	
	Specification Tolerance	
	L	U
Stability, minimum, pounds	1800	--
Flow, 0.01-inch	8	16
Air Voids Total Mix, percent	2	5
Mat Density, percent	96.3	--
Joint density, percent	95.5	--

The criteria in Table 5 are based on production processes which have variability with the following standard deviations:

Surface Course Mat Density (%), 1.30
Base Course Mat Density (%), 1.55
Joint Density (%), 2.1

The Contractor should note that

- (1) 90 PWL is achieved when consistently producing a surface course with an average mat density of at least 98 percent with 1.30% or less variability,
- (2) 90 PWL is achieved when consistently producing a base course with an average mat density of at least 97.5 percent with 1.55% or less variability, and
- (3) 90 PWL is achieved when consistently producing joints with an average joint density of at least 96 percent with 2.1% or less variability.

401-5.3 RESAMPLING PAVEMENT FOR MAT DENSITY.

a. General. Resampling of a lot of pavement will only be allowed for mat density, and then, only if the Contractor requests same, in writing, within 48 hours after receiving the written test results from the Engineer. A

retest will consist of all the sampling and testing procedures contained in paragraphs 401-5.1b and 401-5.2b(1). Only one resampling per lot will be permitted.

(1) A redefined PWL shall be calculated for the resampled lot. The number of tests used to calculate the redefined PWL shall include the initial tests made for that lot plus the retests.

(2) The cost for resampling and retesting shall be borne by the Contractor.

b. Payment for Resampled Lots. The redefined PWL for a resampled lot shall be used to calculate the payment for that lot in accordance with Table 6.

c. Outliers. Check for outliers in accordance with ASTM E 178, at a significance level of 5 percent.

CONTRACTOR QUALITY CONTROL

401-6.1 GENERAL. The Contractor shall develop a Quality Control Program in accordance with Section 100 of the General Provisions. The program shall address all elements that affect the quality of the pavement including, but not limited to:

- a. Mix Design
- b. Aggregate Grading
- c. Quality of Materials
- d. Stockpile Management
- e. Proportioning
- f. Mixing and Transportation
- g. Placing and Finishing
- h. Joints
- i. Compaction
- j. Surface Smoothness
- k. Personnel
- l. Laydown Plan

The Contractor shall perform quality control sampling, testing, and inspection during all phases of the work and shall perform them at a rate sufficient to ensure that the work conforms to the contract requirements, and at minimum test frequencies required by paragraph 401-6.3 and Section 100 of the General Provisions. As a part of the process for approving the Contractor's plan, the Engineer may require the Contractor's technician to perform testing of samples to demonstrate an acceptable level of performance.

No partial payment will be made for materials that are subject to specific quality control requirements without an approved plan.

401-6.2 TESTING LABORATORY. The Contractor shall provide a fully equipped asphalt laboratory meeting the requirements of paragraph 401-3.5 and 401-4.2a(2) located at the plant or job site. The Contractor shall provide the Engineer with certification stating that all of the testing equipment to be used is properly calibrated and will meet the specifications applicable for the specified test procedures.

401-6.3 QUALITY CONTROL TESTING. The Contractor shall perform all quality control tests necessary to control the production and construction processes applicable to these specifications and as set forth in the approved Quality Control Program. The testing program shall include, but not necessarily be limited to, tests for the control of asphalt content, aggregate gradation, temperatures, aggregate moisture, field compaction, and surface smoothness. A Quality Control Testing Plan shall be developed as part of the Quality Control Program.

a. Asphalt Content. A minimum of two tests shall be performed per lot in accordance with ASTM D 6307 or ASTM D 2172 for determination of asphalt content. The weight of ash portion of the test, as described in ASTM D

2172, shall be determined as part of the first test performed at the beginning of plant production; and as part of every tenth test performed thereafter, for the duration of plant production. The last weight of ash value obtained shall be used in the calculation of the asphalt content for the mixture. The asphalt content for the lot will be determined by averaging the test results.

The use of the nuclear method for determining asphalt content in accordance with ASTM D 4125 is permitted, provided that it is calibrated for the specific mix being used.

b. Gradation. Aggregate gradations shall be determined a minimum of twice per lot from mechanical analysis of extracted aggregate in accordance with ASTM D 5444 and ASTM C 136 (Dry Sieve). When asphalt content is determined by the nuclear method, aggregate gradation shall be determined from hot bin samples on batch plants, or from the cold feed on drum mix or continuous mix plants, and tested in accordance with ASTM C 136 (dry sieve) using actual batch weights to determine the combined aggregate gradation of the mixture.

c. Moisture Content of Aggregate. The moisture content of aggregate used for production shall be determined a minimum of once per lot in accordance with ASTM C 566.

d. Moisture Content of Mixture. The moisture content of the mixture shall be determined once per lot in accordance with ASTM D 1461.

e. Temperatures. Temperatures shall be checked, at least four times per lot, at necessary locations to determine the temperatures of the dryer, the bitumen in the storage tank, the mixture at the plant, and the mixture at the job site.

f. In-Place Density Monitoring. The Contractor shall conduct any necessary testing to ensure that the specified density is being achieved. A nuclear gauge may be used to monitor the pavement density in accordance with ASTM D 2950.

g. Additional Testing. Any additional testing that the Contractor deems necessary to control the process may be performed at the Contractor's option.

h. Monitoring. The Engineer reserves the right to monitor any or all of the above testing.

401-6.4 SAMPLING. When directed by the Engineer, the Contractor shall sample and test any material that appears inconsistent with similar material being sampled, unless such material is voluntarily removed and replaced or deficiencies corrected by the Contractor. All sampling shall be in accordance with standard procedures specified.

401-6.5 CONTROL CHARTS. The Contractor shall maintain linear control charts both for individual measurements and range (i.e., difference between highest and lowest measurements) for aggregate gradation and asphalt content.

Control charts shall be posted in a location satisfactory to the Engineer and shall be kept current. As a minimum, the control charts shall identify the project number, the contract item number, the test number, each test parameter, the Action and Suspension Limits applicable to each test parameter, and the Contractor's test results. The Contractor shall use the control charts as part of a process control system for identifying potential problems and assignable causes before they occur. If the Contractor's projected data during production indicates a problem and the Contractor is not taking satisfactory corrective action, the Engineer may suspend production or acceptance of the material.

a. Individual Measurements. Control charts for individual measurements shall be established to maintain process control within tolerance for aggregate gradation and asphalt content. The control charts shall use the job mix formula target values as indicators of central tendency for the following test parameters with associated Action and Suspension Limits:

CONTROL CHART LIMITS FOR INDIVIDUAL MEASUREMENTS		
Sieve	Action Limit	Suspension Limit
¾ inch (19.0 mm)	0%	0%
½ inch (12.5 mm)	+/-6%	+/-9%
⅜ inch (9.5 mm)	+/-6%	+/-9%
No. 4 (4.75 mm)	+/-6%	+/-9%
No. 16 (1.18 mm)	+/-5%	+/-7.5%
No. 50 (0.30 mm)	+/-3%	+/-4.5%
No. 200 (0.075 mm)	+/-2%	+/-3%
Asphalt Content	+/-0.45%	+/-0.70%

b. Range. Control charts for range shall be established to control process variability for the test parameters and Suspension Limits listed below. The range shall be computed for each lot as the difference between the two test results for each control parameter. The Suspension Limits specified below are based on a sample size of $n = 2$. Should the Contractor elect to perform more than two tests per lot, the Suspension Limits shall be adjusted by multiplying the Suspension Limit by 1.18 for $n = 3$ and by 1.27 for $n = 4$.

CONTROL CHART LIMITS BASED ON RANGE (Based on $n = 2$)	
Sieve	Suspension Limit
½ inch (12.5 mm)	11 percent
⅜ inch (9.5 mm)	11 percent
No. 4 (4.75 mm)	11 percent
No. 16 (1.18 mm)	9 percent
No. 50 (0.30 mm)	6 percent
No. 200 (0.075 mm)	3.5 percent
Asphalt Content	0.8 percent

c. Corrective Action. The Contractor Quality Control Program shall indicate that appropriate action shall be taken when the process is believed to be out of tolerance. The Plan shall contain sets of rules to gauge when a process is out of control and detail what action will be taken to bring the process into control. As a minimum, a process shall be deemed out of control and production stopped and corrective action taken, if:

- (1) One point falls outside the Suspension Limit line for individual measurements or range; or
- (2) Two points in a row fall outside the Action Limit line for individual measurements.

401-6.6 QUALITY CONTROL REPORTS. The Contractor shall maintain records and shall submit reports of quality control activities daily, in accordance with the Contractor Quality Control Program described in General Provisions, Section 100.

METHOD OF MEASUREMENT

401-7.1 MEASUREMENT. Plant mix bituminous concrete pavement shall be measured by the number of tons (kg) of bituminous mixture used in the accepted work. Recorded batch weights or truck scale weights will be used to determine the basis for the tonnage.

In the event that the average thickness of test cores taken from the completed hot mix asphalt pavement exceeds the specified thickness of each course by more than one-quarter of an inch per lift, the tonnage for the completed pavement will be computed by deducting from the gross tonnage of pavement an amount equal to the excess thickness taken over the entire affected area.

BASIS OF PAYMENT

401-8.1 PAYMENT. Payment for an accepted lot of bituminous concrete pavement shall be made at the contract unit price per ton (kg) for bituminous mixture adjusted according to paragraph 401-8.1a, subject to the limitation that:

The total project payment for plant mix bituminous concrete pavement shall not exceed 100 percent of the product of the contract unit price and the total number of tons (kg) of bituminous mixture used in the accepted work (See Note 2 under Table 6).

The price shall be compensation for furnishing all materials, for all preparation, mixing, and placing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

a. Basis of Adjusted Payment. The pay factor for each individual lot shall be calculated in accordance with Table 6. A pay factor shall be calculated for both mat density and air voids. The lot pay factor shall be the higher of the two values when calculations for both mat density and air voids are 100 percent or higher. The lot pay factor shall be the product of the two values when only one of the calculations for either mat density or air voids is 100 percent or higher. The lot pay factor shall be the lower of the two values when calculations for both mat density and air voids are less than 100 percent.

TABLE 6. PRICE ADJUSTMENT SCHEDULE ¹

Percentage of Material Within Specification Limits (PWL)	Lot Pay Factor (Percent of Contract Unit Price)
96 – 100	106
90 – 95	PWL + 10
75 – 89	0.5 PWL + 55
55 – 74	1.4PWL – 12
Below 55	Reject ²

¹ ALTHOUGH IT IS THEORETICALLY POSSIBLE TO ACHIEVE A PAY FACTOR OF 106 PERCENT FOR EACH LOT, ACTUAL PAYMENT ABOVE 100 PERCENT SHALL BE SUBJECT TO THE TOTAL PROJECT PAYMENT LIMITATION SPECIFIED IN PARAGRAPH 401-8.1.

² The lot shall be removed and replaced. However, the Engineer may decide to allow the rejected lot to remain. In that case, if the Engineer and Contractor agree in writing that the lot shall not be removed, it shall be paid for at 50 percent of the contract unit price and the total project payment shall be reduced by the amount withheld for the rejected lot.

For each lot accepted, the adjusted contract unit price shall be the product of the lot pay factor for the lot and the contract unit price. Payment shall be subject to the total project payment limitation specified in paragraph 401-8.1. Payment in excess of 100 percent for accepted lots of bituminous concrete pavement shall be used to offset payment for accepted lots of bituminous concrete pavement that achieve a lot pay factor less than 100 percent.

b. Payment. Payment will be made under:

Item P-401-1	Plant Mix Bituminous Pavement	per ton
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TESTING REQUIREMENTS

ASTM C 29	Bulk Density ("Unit Weight") and Voids in Aggregate
ASTM C 88	Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate

ASTM C 117	Materials Finer than 75µm (No.200) Sieve in Mineral Aggregates by Washing
ASTM C 127	Specific Gravity and Absorption of Coarse Aggregate
ASTM C 131	Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C 136	Sieve Analysis of Fine and Coarse Aggregates
ASTM C 183	Sampling and the Amount of Testing of Hydraulic Cement
ASTM C 566	Total Evaporable Moisture Content of Aggregate by Drying
ASTM D 75	Sampling Aggregates
ASTM D 979	Sampling Bituminous Paving Mixtures
ASTM D 995	Mixing Plants for Hot-Mixed Hot-Laid Bituminous Paving Mixtures
ASTM D 1073	Fine Aggregate for Bituminous Paving Mixtures
ASTM D 1188	Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens
ASTM D 1461	Moisture or Volatile Distillates in Bituminous Paving Mixtures
ASTM D 2041	Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
ASTM D 2172	Quantitative Extraction of Bitumen from Bituminous Paving Mixtures
ASTM D 2419	Sand Equivalent Value of Soils and Fine Aggregate
ASTM D 2489	Estimating Degree of Particle Coating of Bituminous-Aggregate Mixtures
ASTM D 2726	Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures
ASTM D 2950	Density of Bituminous Concrete in Place by Nuclear Methods
ASTM D 3203	Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures
ASTM D 3665	Random Sampling of Construction Materials
ASTM D 3666	Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials
ASTM D 4125	Asphalt Content of Bituminous Mixtures by the Nuclear Method
ASTM D 4318	Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D 4791	Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
ASTM D 4867	Effect of Moisture on Asphalt Concrete Paving Mixtures

ASTM D 5444	Mechanical Size Analysis of Extracted Aggregate
ASTM D 6926	Preparation of Bituminous Specimens Using MARSHALL Apparatus
ASTM D 6927	MARSHALL Stability and Flow of Bituminous Mixtures
ASTM E 11	Wire-Cloth Sieves for Testing Purposes
ASTM E 178	Dealing with Outlying Observations
AASHTO T 30	Mechanical Analysis of Extracted Aggregate
The Asphalt Institute's Manual No. 2 (MS-2)	Mix Design Methods for Asphalt Concrete

MATERIAL REQUIREMENTS

ASTM D 242	Mineral Filler for Bituminous Paving Mixtures
ASTM D 946	Penetration Graded Asphalt Cement for Use in Pavement Construction
ASTM D 3381	Viscosity-Graded Asphalt Cement for Use in Pavement Construction
ASTM D 4552	Classifying Hot-Mix Recycling Agents
AASHTO M320	Performance Graded Asphalt Binder

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ITEM P-602
BITUMINOUS PRIME COAT

CONTRACT DOCUMENTS

602-0.1 This section of these specifications is a part of the Contract Documents as defined in the Contract Articles. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other sections.

Attention shall be directed to the sections of these specifications entitled, "Summary of Work and Special Work Requirements" and "Supplemental Contract Articles".

DESCRIPTION

602-1.1 This item shall consist of an application of bituminous material on the prepared base course in accordance with these specifications and in reasonably close conformity to the lines shown on the plans.

MATERIALS

602-2.1 BITUMINOUS MATERIAL. The types, grades, controlling specifications, and application temperatures for the bituminous materials are given in Table 1. The Engineer shall designate the specific material to be used.

Table 1 Bituminous Material

Type and Grade	Specification	Application Temperatures ¹	
		Deg. F	Deg. C
Emulsified Asphalt			
SS-1, SS-1h	ASTM D 977	70-160	20-70
MS-2, HFMS-1	ASTM D 977	70-160	20-70
CSS-1, CSS-1h	ASTM D 2397	70-160	20-70
CMS-2	ASTM D 2397	70-160	20-70
Cutback Asphalt			
RC-30	ASTM D 2028	80+	30+
RC-70	ASTM D 2028	120+	50+
RC-250	ASTM D 2028	165+	75+
¹ The maximum temperature for cutback asphalt shall be that at which fogging occurs.			

CONSTRUCTION METHODS

602-3.1 WEATHER LIMITATIONS. The prime coat shall be applied only when the existing surface is dry or contains sufficient moisture to get uniform distribution of the bituminous material, when the atmospheric temperature is above 60 °F (15 °C), and when the weather is not foggy or rainy. The temperature requirements may be waived, but only when so directed by the Engineer.

602-3.2 EQUIPMENT. The equipment used by the Contractor shall include a self-powered pressure bituminous material distributor and equipment for heating bituminous material.

The distributor shall be designed, equipped, maintained, and operated so that bituminous material at even heat may be applied uniformly on variable widths of surface at the specified rate. The allowable variation from the specified rate shall not exceed 10 percent. Distributor equipment shall include a tachometer, pressure gauges, volume-

measuring devices or a calibrated tank, and a thermometer for measuring temperatures of tank contents. The distributor shall be self-powered and shall be equipped with a power unit for the pump and full circulation spray bars adjustable laterally and vertically.

If the distributor is not equipped with an operable quick shut off valve, the prime operations shall be started and stopped on building power. The Contractor shall remove blotting sand prior to asphalt concrete lay down operations at no additional expense to the owner.

A power broom and/or blower shall be provided for any required cleaning of the surface to be treated.

602-3.3 APPLICATION OF BITUMINOUS MATERIAL. Immediately before applying the prime coat, the full width of the surface to be primed shall be swept with a power broom to remove all loose dirt and other objectionable material.

The bituminous material including solvent shall be uniformly applied with a bituminous distributor at the rate of 0.25 to 0.50 gallons per square yard (1.20 to 2.40 liters per square meter) depending on the base course surface texture. The type of bituminous material and application rate shall be approved by the Engineer prior to application.

Following the application, the primed surface shall be allowed to dry not less than 48 hours without being disturbed or for such additional time as may be necessary to permit the drying out of the prime coat until it will not be picked up by traffic or equipment. This period shall be determined by the Engineer. The surface shall then be maintained by the Contractor until the surfacing has been placed. Suitable precautions shall be taken by the Contractor to protect the primed surface against damage during this interval, including supplying and spreading any sand necessary to blot up excess bituminous material.

602-3.4 BITUMINOUS MATERIAL CONTRACTOR'S RESPONSIBILITY. Samples of the bituminous materials that the Contractor proposes to use, together with a statement as to their source and character, must be submitted and approved before use of such material begins. The Contractor shall require the manufacturer or producer of the bituminous materials to furnish material subject to this and all other pertinent requirements of the contract. Only satisfactory materials, so demonstrated by service tests, shall be acceptable.

The Contractor shall furnish vendor's certified test reports for each carload, or equivalent, of bituminous material shipped to the project. The test reports shall contain all the data required by the applicable specification. If the Contractor applies the prime material prior to receipt of the tests reports, payment for the material shall be withheld until they are received. If the material does not pass the specifications it shall be replaced at the contractor's expense. The report shall be delivered to the Engineer before permission is granted for use of the material. The furnishing of the vendor's certified test report for the bituminous material shall not be interpreted as basis for final acceptance. All such test reports shall be subject to verification by testing samples of materials received for use on the project.

602-3.5 FREIGHT AND WEIGH BILLS. Before the final estimate is allowed, the Contractor shall file with the Engineer receipted bills when railroad shipments are made, and certified weigh bills when materials are received in any other manner, of the bituminous materials actually used in the construction covered by the contract. The Contractor shall not remove bituminous material from the tank car or storage tank until the initial outage and temperature measurements have been taken by the Engineer, nor shall the car or tank be released until the final outage has been taken by the Engineer.

Copies of freight bills and weigh bills shall be furnished to the Engineer during the progress of the work.

METHOD OF MEASUREMENT

602-4.1 The bituminous material for prime coat shall be measured by the gallon. Volume shall be corrected to the volume at 60 °F (15 °C) in accordance with ASTM D 1250 for cutback asphalt, and Table IV-3 of The Asphalt Institute's Manual MS-6 for emulsified asphalt.

BASIS OF PAYMENT

602-5.1 Payment shall be made at the contract unit price per gallon for bituminous prime coat. This price shall be full compensation for furnishing all materials and for all preparation, delivering, and applying the materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Payment will be made under:

Item P-602-1	Bituminous Prime Coat	per gallon
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TESTING REQUIREMENTS

ASTM D 1250	Petroleum Measurement Tables
Asphalt Institute Manual MS-6 Table IV-3	Asphalt Pocketbook of Useful Information (Temperature-Volume Corrections for Emulsified Asphalts)

MATERIAL REQUIREMENTS

ASTM D 977	Emulsified Asphalt
ASTM D 2028	Cutback Asphalt (Rapid Curing Type)
ASTM D 2397	Cationic Emulsified Asphalt

END OF ITEM P-602

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ITEM P- 603
BITUMINOUS TACK COAT

CONTRACT DOCUMENTS

603-0.1 This section of these specifications is a part of the Contract Documents as defined in the Contract Articles. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other sections.

Attention shall be directed to the sections of these specifications entitled, "Summary of Work and Special Work Requirements" and "Supplemental Contract Articles".

DESCRIPTION

603-1.1 This item shall consist of preparing and treating a bituminous or concrete surface with bituminous material in accordance with these specifications and in reasonably close conformity to the lines shown on the plans.

MATERIALS

603-2.1 BITUMINOUS MATERIALS. The bituminous material shall be either cutback asphalt, emulsified asphalt, or tar and shall conform to the requirements of Table 1. The type, grade, controlling specification, and application temperature of bituminous material to be used shall be specified by the Engineer.

TABLE 1. BITUMINOUS MATERIAL		
Type and Grade	Specification	Application Temperature Deg. F
Emulsified Asphalt		
SS-1, SS-1h	ASTM D 977	75-130
CSS-1, CSS-1h	ASTM D 2397	75-130

CONSTRUCTION METHODS

603-3.1 WEATHER LIMITATIONS. The tack coat shall be applied only when the existing surface is dry and the atmospheric temperature is above 60°F. The temperature requirements may be waived, but only when so directed by the Engineer.

603-3.2 EQUIPMENT. The Contractor shall provide equipment for heating and applying the bituminous material.

The distributor shall be designed, equipped, maintained, and operated so that bituminous material at even heat may be applied uniformly on variable widths of surface at the specified rate. The allowable variation from the specified rate shall not exceed 10 percent. Distributor equipment shall include a tachometer, pressure gages, volume-measuring devices or a calibrated tank, and a thermometer for measuring temperatures of tank contents. The distributor shall be self-powered and shall be equipped with a power unit for the pump and full circulation spray bars adjustable laterally and vertically.

If the distributor is not equipped with an operable quick shut off valve, the tack operations shall be started and stopped on building paper. The Contractor shall remove blotting sand prior to asphalt concrete lay down operations at no additional expense to the owner.

A power broom and/or blower shall be provided for any required cleaning of the surface to be treated.

603-3.3 APPLICATION OF BITUMINOUS MATERIAL. Immediately before applying the tack coat, the full width of surface to be treated shall be swept with a power broom and/or airblast to remove all loose dirt and other objectionable material.

Emulsified asphalt shall be diluted by the addition of water when directed by the Engineer and shall be applied a sufficient time in advance of the paver to ensure that all water has evaporated before any of the overlying mixture is placed on the tacked surface.

The bituminous material including vehicle or solvent shall be uniformly applied with a bituminous distributor at the rate of 0.05 to 0.15 gallons per square yard depending on the condition of the existing surface. The type of bituminous material and application rate shall be approved by the Engineer prior to application.

Following the application, the surface shall be allowed to cure without being disturbed for such period of time as may be necessary to permit drying out and setting of the tack coat. This period shall be determined by the Engineer. The surface shall then be maintained by the Contractor until the next course has been placed. Suitable precautions shall be taken by the Contractor to protect the surface against damage during this interval.

603-3.4 BITUMINOUS MATERIAL CONTRACTOR'S RESPONSIBILITY. Samples of the bituminous material that the Contractor proposes to use, together with a statement as to its source and character, must be submitted and approved before use of such material begins. The Contractor shall require the manufacturer or producer of the bituminous material to furnish material subject to this and all other pertinent requirements of the contract. Only satisfactory materials so demonstrated by service tests, shall be acceptable.

The Contractor shall furnish the vendor's certified test reports for each carload, or equivalent, of bituminous material shipped to the project. The tests reports shall contain all the data required by the applicable specification. If the Contractor applies the material prior to receipt of the tests reports, payment for the material shall be withheld until they are received. If the material does not pass the specifications it shall be replaced at the contractor's expense. The report shall be delivered to the Engineer before permission is granted for use of the material. The furnishing of the vendor's certified test report for the bituminous material shall not be interpreted as a basis for final acceptance. All such test reports shall be subject to verification by testing samples of material received for use on the project.

603-3.5 FREIGHT AND WEIGH BILLS. Before the final estimate is allowed, the Contractor shall file with the Engineer receipted bills when railroad shipments are made, and certified weigh bills when materials are received in any other manner, of the bituminous materials actually used in the construction covered by the contract. The Contractor shall not remove bituminous material from the tank car or storage tank until the initial outage and temperature measurements have been taken by the Engineer, nor shall the car or tank be released until the final outage has been taken by the Engineer. Copies of freight bills and weigh bills shall be furnished to the Engineer during the progress of the work.

METHOD OF MEASUREMENT

603-4.1 The bituminous material for tack coat shall be measured by the gallon. Volume shall be corrected to the volume at 60°F in accordance with ASTM D 1250 for cutback asphalt, ASTM D 633 for tar, and Table IV-3 of The Asphalt Institute's Manual MS-6 for emulsified asphalt. Water added to emulsified asphalt will not be measured for payment.

BASIS OF PAYMENT

603.5-1 Payment shall be made at the contract unit price per gallon of bituminous material. This price shall be full compensation for furnishing all materials, for all preparation, delivery, and application of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-603-1	Bituminous Tack Coat	per Gallon
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MATERIAL REQUIREMENTS

ASTM D 633	Volume Correction Table for Road Tar
ASTM D 977	Emulsified Asphalt
ASTM D 1250	Petroleum Measurement Tables
ASTM D 2028	Cutback Asphalt (Rapid-Curing Type)
ASTM D 2397	Cationic Emulsified Asphalt
Asphalt Institute Manual MS-6 Table IV-3	Asphalt Pocketbook of Useful Information (Temperature-Volume Corrections for Emulsified Asphalts)

END ITEM P-603

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ITEM P- 605
JOINT SEALING FILLER

CONTRACT DOCUMENTS

605-0.1 This section of these specifications is a part of the Contract Documents as defined in the Contract Articles. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other sections.

Attention shall be directed to the sections of these specifications entitled, "Summary of Work and Special Work Requirements" and "Supplemental Contract Articles".

DESCRIPTION

605-1.1 This item shall consist of providing and installing a resilient and adhesive joint sealing filler capable of effectively sealing joints and cracks in pavements.

MATERIALS

605-2.1 JOINT SEALERS. Joint sealing materials shall meet the requirements of ASTM D 6690 - Joint and Crack Sealants, Hot-Applied, for Concrete and Asphalt Pavements. Each lot or batch of sealing compound shall be delivered to the jobsite in the manufacturer's original sealed container. Each container shall be marked with the manufacturer's name, batch or lot number, the safe heating temperature, and shall be accompanied by the manufacturer's certification stating that the compound meets the requirements of this specification.

605-2.2 MATERIAL ACCEPTANCE. Prior to use of materials, the Contractor shall submit certified test reports to the Engineer for those materials proposed for use during construction. The certification shall show the appropriate ASTM test(s) for each material, the test results, and a statement that the material passed or failed.

The Engineer may request samples for testing, prior to and during production, to verify the quality of the materials and to ensure conformance with the applicable specifications.

CONSTRUCTION METHODS

605-3.1 TIME OF APPLICATION. Joints shall be sealed as soon after completion of the curing period as feasible and before the pavement is opened to traffic, including construction equipment. The pavement temperature shall be above 50°F at the time of installation of the poured joint sealing material. If the pavement must be opened to traffic prior to placement of the sealant, the Contractor will be required to temporarily fill the joint with jute or nylon rope immediately after the joint is sawed. The rope should be slightly larger than the joint and should be forced into the joint so that the top of the rope is 1/8 inch below the pavement surface. The rope shall be removed immediately prior to cleaning.

605-3.2 PREPARATION OF JOINTS.

a. Sawing. All joints shall be sawed in accordance with specifications and plan details. Immediately after sawing the joint, the resulting slurry shall be completely removed from joint and adjacent area by flushing with a jet of water, and by use of other tools as necessary.

b. Sealing. Immediately before sealing, the joints shall be thoroughly cleaned of all remaining laitance and other foreign material. Cleaning shall be accomplished by sandblasting. Sandblasting shall be accomplished in a minimum of two passes. One pass per joint face with the nozzle held at an angle directly toward the joint face and not more than 3 inches from it. Upon completion of cleaning, the joints shall be blown out with compressed air free of oil and water. Only air compressors with operable oil and water traps shall be used to prepare the joints for sealing. The joint faces shall be surface dry when the seal is applied.

605-3.3 INSTALLATION OF SEALANTS. Joints shall be inspected for proper width, depth, alignment, and preparation, and shall be approved by the Engineer before sealing is allowed. Sealants shall be installed in accordance with the following requirements:

Hot Poured Sealants. The joint sealant shall be applied uniformly solid from bottom to top and shall be filled without formation of entrapped air or voids. A backing material shall be placed as shown on the plans and shall be both non-reactive and non-adhesive to the concrete or the sealant material. The heating kettle shall be an indirect heating type, constructed as a double boiler. A positive temperature control and mechanical agitation shall be provided. The sealant shall not be heated to more than 20°F below the safe heating temperature. The safe heating temperature can be obtained from the manufacturer's shipping container. A direct connecting pressure type extruding device with nozzles shaped for insertion into the joint shall be provided. Any sealant spilled on the surface of the pavement, structures and/or lighting fixtures shall be removed immediately.

METHOD OF MEASUREMENT

605-4.1 Joint sealing material shall not be measured separately, but shall be considered incidental to construction of Bituminous Concrete Saw-Cut Control Joints as specified in specification section M-003 "Saw Cut Control Joints".

BASIS OF PAYMENT

605-5.1 Payment for joint sealing material shall be made in accordance with and considered incidental to payment item M-003-1 *Sawed Control Joint*. The price shall be full compensation for furnishing all materials, for all preparation, delivering, and placing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

TESTING REQUIREMENTS

ASTM D 412 Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension

ASTM D 1644 Test Methods for Nonvolatile Content of Varnishes

MATERIAL REQUIREMENTS

ASTM D 6690 Joint and Crack Sealants, Hot-Applied, for Concrete and Asphalt Pavements

END ITEM P-605

ITEM P- 606
ADHESIVE COMPOUNDS, TWO-COMPONENT FOR SEALING WIRE AND LIGHTS IN PAVEMENT

CONTRACT DOCUMENTS

606-0.1 This section of these specifications is a part of the Contract Documents as defined in the Contract Articles. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other sections.

Attention shall be directed to the sections of these specifications entitled, "Summary of Work and Special Work Requirements" and "Supplemental Contract Articles".

DESCRIPTION

606-1.1. This specification covers two types of material; a liquid suitable for sealing electrical wire in saw cuts in pavement and for sealing light fixtures or bases in pavement, and a paste suitable for embedding light fixtures in the pavement. Both types of material are two-component filled formulas with the characteristics specified in paragraph 606-2.4. Materials supplied for use with bituminous concrete pavements must be formulated so they are compatible with the bituminous concrete.

EQUIPMENT AND MATERIALS

606-2.1 CURING. When prewarmed to 77°F (25°C), mixed, and placed in accordance with manufacturer's directions, the materials shall cure at temperatures of 45°F (7°C) or above without the application of external heat.

606-2.2 STORAGE. The adhesive components shall not be stored at temperatures over 86°F (30°C).

606-2.3 CAUTION. Installation and use shall be in accordance with the manufacturer's recommended procedures. Avoid prolonged or repeated contact with skin. In case of contact, wash with soap and flush with water. If taken internally, call doctor. Keep away from heat or flame. Avoid vapor. Use in well-ventilated areas. Keep in cool place. Keep away from children.

606-2.4 CHARACTERISTICS. When mixed and cured in accordance with the manufacturer's directions, the materials shall have the following properties shown in Table 1.

SAMPLING, INSPECTION, AND TEST PROCEDURES

606-3.1 TENSILE PROPERTIES. Tests for tensile strength and elongation shall be conducted in accordance with ASTM D 638.

606-3.2 EXPANSION. Tests for coefficients of linear and cubical expansion shall be conducted in accordance with ASTM D 1168, Method B, except that mercury shall be used instead of glycerine. The test specimen(s) shall be mixed in the proportions specified by the manufacturer, and cured in a glass tub approximately 2 inches (50 mm) long by 3/8 inch (9 mm) in diameter. The interior of the tube shall be precoated with a silicone mold release agent. The hardened sample shall be removed from the tube and aged at room temperature for 1 week before conducting the test. The test temperature range shall be from 35°F (2°C) to 140°F (60°C).

606-3.3 TEST FOR DIELECTRIC STRENGTH. Test for dielectric strength shall be conducted in accordance with ASTM D 149 for sealing compounds to be furnished for sealing electrical wires in pavement.

TABLE 1. PROPERTY REQUIREMENTS

Physical or Electrical Property	Minimum	Maximum	ASTM Method
Tensile			
Portland Cement Concrete	1,000 psi (70 kg/sq.cm)		D 638
Bituminous Concrete	500 psi (35 kg/sq.cm)		
Elongation			
Portland Cement Concrete		\1\	D 638
Bituminous Concrete	50%		D 638
Coef. of cub. exp.			
cu. cm/cu. cm/degree C	0.00090	0.00120	D 1168
Coef. of lin. exp.			
cm/cm/degree C	0.00030	0.00040	D 1168
Dielectric strength,			
short time test	350 volts/mil.		D 149
Arc resistance	125 secs.		D 495
Adhesion to steel	1,000 psi (70 kg/sq.cm)		
Adhesion to portland cement concrete	200 psi (14 kg/sq.cm)		
Adhesion to asphalt concrete	(no test available)		

\1\ 20% or more (without filler) for formulations to be supplied for areas subject to freezing.

606-3.4 TEST FOR ARC RESISTANCE. Test for arc resistance shall be conducted in accordance with ASTM D 495 for sealing compounds to be furnished for sealing electrical wires in pavement.

606-3.5 TEST FOR ADHESION TO STEEL. The ends of two smooth, clean, steel specimens of convenient size (1 inch by 1 inch by 6 inches) (25 by 25 by 150 mm) would be satisfactory when bonded together with adhesive mixture and allowed to cure at room temperature for a period of time to meet formulation requirements and then tested to failure on a Riehle (or similar) tensile tester. The thickness of adhesive to be tested shall be 1/4 inch (6 mm).

606-3.6 ADHESION TO PORTLAND CEMENT CONCRETE

a. Concrete Test Block Preparation. The aggregate grading shall be as shown in Table 2.

The coarse aggregate shall consist of crushed rock having a minimum of 75% of the particles with at least one fractured face and having a water absorption of not more than 1.5%. The fine aggregate shall consist of crushed sand manufactured from the same parent rock as the coarse aggregate. The concrete shall have a water-cement ratio of 5.5 gallons (21 liters) of water per bag of cement, a cement factor of 6, plus or minus 0.5, bags of cement per cubic yard (0.76 cubic meter) of concrete, and a slump of 2-1/2 inches, plus or minus 1/2 inch (60 mm plus or minus 12 mm). The ratio of fine aggregate to total aggregate shall be approximately 40% by solid volume. The air content shall be 5.0%, plus or minus 0.5%, and it shall be obtained by the addition to the batch of an air-entraining admixture such as vinsol resin. The mold shall be of metal and shall be provided with a metal base plate. Means shall be provided for securing the base plate to the mold. The assembled mold and base plate shall be watertight and shall be oiled with mineral oil before use. The inside measurement of the mold shall be such that several 1-inch by

2-inch by 3-inch (25 by 50 by 75 mm) test blocks can be cut from the specimen with a concrete saw having a diamond blade. The concrete shall be prepared and cured in accordance with ASTM C 192.

TABLE 2. AGGREGATE FOR BOND TEST BLOCKS

Type	Sieve Size	Percent Passing
Coarse Aggregate	3/4 inch (19.0 mm)	97 to 100
	1/2 inch (12.5 mm)	63 to 69
	3/8 inch (9.5 mm)	30 to 36
	No. 4 (4.75 mm)	0 to 3
Fine Aggregate	No. 4 (4.75 mm)	100
	No. 8 (2.36 mm)	82 to 88
	No. 16 (1.18 mm)	60 to 70
	No. 30 (600 micro-m)	40 to 50
	No. 50 (300 micro-m)	16 to 26
	No. 100 (150 micro-m)	5 to 9

b. Bond Test. Prior to use, oven-dry the test blocks to constant weight at a temperature of 220 to 230°F (104°C to 110°C), cool to room temperature, 73.4 plus or minus 3°F (23°C plus or minus 1.6°C), in a desiccator, and clean the surface of the blocks of film or powder by vigorous brushing with a stiff-bristled fiber brush. Two test blocks shall be bonded together on the 1-inch by 3-inch (25 by 75 mm) sawed face with the adhesive mixture and allowed to cure at room temperature for a period of time to meet formulation requirements and then tested to failure in a Riehle (or similar) tensile tester. The thickness of the adhesive to be tested shall be 1/4 inch (6 mm).

606-3.7 COMPATIBILITY WITH ASPHALT CONCRETE. Test for compatibility with asphalt in accordance with ASTM D 5329.

606-3.8 ADHESIVE COMPOUNDS - CONTRACTOR'S RESPONSIBILITY. The Contractor shall furnish the vendor's certified test reports for each batch of material delivered to the project. The report shall certify that the material meets specification requirements and is suitable for use with portland cement concrete and bituminous concrete pavements. The report shall be delivered to the Engineer before permission is granted for use of the material. In addition the Contractor shall obtain a statement from the supplier or manufacturer that guarantees the material for one year. The supplier or manufacturer shall furnish evidence that the material has performed satisfactorily on other projects.

606-3.9 APPLICATION. Adhesive shall be applied on a dry, clean surface, free of grease, dust, and other loose particles. The method of mixing and application shall be in strict accordance with the manufacturer's recommendations.

The manufacturer's representative shall be present to during the initial installation of the material to ensure the installation procedures are in accordance with the manufacturer's directions

METHOD OF MEASUREMENT

606-4.1 No measurement will be made for direct payment of adhesive, as the cost of furnishing and installing shall be considered as a subsidiary obligation in the completion of the installation.

TESTING REQUIREMENTS

ASTM C 192 Making and Curing Concrete Compression and Flexure Test Specimens in the Laboratory.

ASTM D 149	Tests for Dielectric Breakdown Voltage and Dielectric Strength of Electrical Insulating Materials at Commercial Power Frequencies.
ASTM D 495	Test for High-Voltage, Low-Current, Dry Arc Resistance of Solid Electrical Insulation Materials
ASTM D 638	Test for Tensile Properties of Plastics
ASTM D 1168	Test for Hydrocarbon Waxes Used for Electrical Insulation
ASTM D 5329	Joint Sealants, Hot-poured, for Concrete and Asphalt Pavements

END OF ITEM P-606

ITEM P- 610
STRUCTURAL PORTLAND CEMENT CONCRETE

CONTRACT DOCUMENTS

610-0.1 This section of these specifications is a part of the Contract Documents as defined in the Contract Articles. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other sections.

Attention shall be directed to the sections of these specifications entitled, "Summary of Work and Special Work Requirements" and "Supplemental Contract Articles".

DESCRIPTION

610-1.1 This item shall consist of reinforced structural Portland Cement Concrete (PCC), prepared and constructed in accordance with these specifications, at the locations and of the form and dimensions shown on the plans.

MATERIALS

610-2.1 GENERAL. Only approved materials, conforming to the requirements of these specifications, shall be used in the work. They may be subjected to inspection and tests at any time during the progress of their preparation or use. The source of supply of each of the materials shall be approved by the Engineer before delivery or use is started. Representative preliminary samples of the materials shall be submitted by the Contractor, when required, for examination and test. Materials shall be scored and handled to insure the preservation of their quality and fitness for use and shall be located to facilitate prompt inspection. All equipment for handling and transporting materials and concrete must be clean before any material or concrete is placed therein.

In no case shall the use of pit-run or naturally mixed aggregates be permitted. Naturally mixed aggregate shall be screened and washed, and all fine and coarse aggregates shall be stored separately and kept clean. The mixing of different kinds of aggregates from different sources in one storage pile or alternating batches of different aggregates will not be permitted.

a. Reactivity. Aggregates shall be tested for deleterious reactivity with alkalis in the cement, which may cause excessive expansion of the concrete. Separate tests of coarse and fine aggregate shall be made in accordance with ASTM C 1260. If the expansion of coarse or fine aggregate test specimens, tested in accordance with ASTM C 1260, does not exceed 0.10 % at 28 days (30 days from casting), the coarse or fine aggregates shall be accepted. If the expansion of any aggregate, coarse or fine, at 28 days is greater than 0.10%, tests of combined materials shall be made in accordance with ASTM C 1567 using the aggregates, cementitious materials, and/or specific reactivity reducing chemicals in the proportions proposed for the mixture design. If the expansion of the proposed combined materials test specimens, tested in accordance with ASTM C 1567, does not exceed 0.10 % at 28 days, the proposed combined materials will be accepted. If the expansion of the proposed combined materials test specimens is greater than 0.10% at 28 days, the aggregates will not be accepted unless adjustments to the combined materials mixture can reduce the expansion to less than 0.10 % at 28 days, or new aggregates shall be evaluated and tested.

Test results must be no more than 12-months old at the time of submission. Test results must be submitted to the engineer for review and approval.

610-2.2 COARSE AGGREGATE. The coarse aggregate for concrete shall meet the requirements of ASTM C 33. Crushed stone aggregate shall have a durability factor, as determined by ASTM C 666, greater than or equal to 95. The Engineer may consider and reserve final approval of other State classification procedures addressing aggregate durability.

Coarse aggregate shall be well graded from coarse to fine and shall meet one of the gradations shown in Table 1, using ASTM C 136.

610-2.3 FINE AGGREGATE. The fine aggregate for concrete shall meet the requirements of ASTM C 33.

The fine aggregate shall be well graded from fine to coarse and shall meet the requirements of Table 2 when tested in accordance with ASTM C 136:

Table 1. Gradation For Coarse Aggregate

Sieve Designation (square openings)	Percentage by Weight Passing Sieves						
	2"	1-1/2"	1"	3/4"	1/2"	3/8"	No.4
No. 4 to 3/4 in. (4.75-19.0 mm)			100	90-100		20-55	0-10
No. 4 to 1 in. (4.75-25.0 mm)		100	90-100		25-60		0-10
No. 4 to 1-1/2 in. (4.75-38.1 mm)	100	95-100		35-70		10-30	0-5

Table 2. Gradation For Fine Aggregate

Sieve Designation (square openings)	Percentage by Weight Passing Sieves
3/8 in (9.5 mm)	100
No. 4 (4.75 mm)	95-100
No. 16 (1.18 mm)	45-80
No. 30 (0.60 mm)	25-55
No. 50 (0.30 mm)	10-30
No. 100 (0.15 mm)	2-10

Blending will be permitted, if necessary, in order to meet the gradation requirements for fine aggregate. Fine aggregate deficient in the percentage of material passing the No. 50 mesh sieve may be accepted, provided that such deficiency does not exceed 5 percent and is remedied by the addition of pozzolanic or cementitious materials other than Portland cement, as specified in 610-2.6 on admixtures, in sufficient quantity to produce the required workability as approved by the Engineer.

610-2.4 CEMENT. Cement shall conform to the requirements of ASTM C150 Type IIA.

The Contractor shall furnish vendors' certified test reports for each carload, or equivalent, of cement shipped to the project. The report shall be delivered to the Engineer before permission to use the cement is granted. All such test reports shall be subject to verification by testing sample materials received for use on the project.

610-2.5 WATER. The water used in concrete shall be free from sewage, oil, acid, strong alkalis, vegetable matter, and clay and loam. If the water is of questionable quality, it shall be tested in accordance with AASHTO T 26.

610-2.6 ADMIXTURES. The use of any material added to the concrete mix shall be approved by the Engineer. Before approval of any material, the Contractor shall be required to submit the results of complete physical and chemical analyses made by an acceptable testing laboratory. Subsequent tests shall be made of samples taken by the Engineer from the supply of the material being furnished or proposed for use on the work to determine whether the admixture is uniform in quality with that approved.

Pozzolanic admixtures shall be flyash or raw or calcined natural pozzolans meeting the requirements of ASTM C 618, Class F or N with the exception of loss of ignition, where the maximum shall be less than 6 percent. Class F or N flyash for use in mitigating alkali-silica reactivity shall have a Calcium Oxide (CaO) content of less than 13 percent and a total equivalent alkali content less than 3 percent.

Air-entraining admixtures shall meet the requirements of ASTM C 260. Air-entraining admixtures shall be added at the mixer in the amount necessary to produce the specified air content.

Water-reducing, set-controlling admixtures shall meet the requirements of ASTM C 494, Type A, water-reducing or Type D, water-reducing and retarding. Water-reducing admixtures shall be added at the mixer separately from air-entraining admixtures in accordance with the manufacturer's printed instructions.

610-2.7 PREMOLDED JOINT MATERIAL. Premolded joint material for expansion joints shall meet the requirements of ASTM 1751.

610-2.8 JOINT FILLER. The filler for joints shall meet the requirements of Item P-605, unless otherwise specified in the proposal.

610-2.9 STEEL REINFORCEMENT. Reinforcing shall consist of **deformed steel bar** conforming to the requirements of ASTM A615.

610-2.10 COVER MATERIALS FOR CURING. Curing materials shall conform to one of the following specifications:

Liquid Membrane-Forming Compounds for Curing Concrete	ASTM C 309, Type 2
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CONSTRUCTION METHODS

610-3.1 GENERAL. The Contractor shall furnish all labor, materials, and services necessary for, and incidental to, the completion of all work as shown on the drawings and specified herein. All machinery and equipment owned or controlled by the Contractor, which he proposes to use on the work, shall be of sufficient size to meet the requirements of the work, and shall be such as to produce satisfactory work; all work shall be subject to the inspection and approval of the Engineer.

610-3.2 CONCRETE COMPOSITION. The concrete shall develop a compressive strength of 4,000 psi (or as otherwise specified) in 28 days as determined by test cylinders made in accordance with ASTM C 31 and tested in accordance with ASTM C 39. The concrete shall contain not less than 470 pounds of cement per cubic yard (280 kg per cubic meter). The concrete shall contain 5 percent of entrained air, plus or minus 1 percent, as determined by ASTM C 231 and shall have a slump of not more than 4 in (10 cm) as determined by ASTM C 143.

610-3.3 ACCEPTANCE SAMPLING AND TESTING. Concrete for each structure will be accepted on the basis of the compressive strength specified in paragraph 3.2. The concrete shall be sampled in accordance with ASTM C 172. Compressive strength specimens shall be made in accordance with ASTM C 31 and tested in accordance with ASTM C 39.

Concrete cylindrical test specimens shall be made in accordance with ASTM C 31 and tested in accordance with ASTM C 39. The Contractor shall cure and store the test specimens under such conditions as directed. The Engineer will make the actual tests on the specimens at no expense to the Contractor.

610-3.4 PROPORTIONING AND MEASURING DEVICES. When package cement is used, the quantity for each batch shall be equal to one or more whole sacks of cement. The aggregates shall be measured separately by weight. If aggregates are delivered to the mixer in batch trucks, the exact amount for each mixer charge shall be contained in each batch compartment. Weighing boxes or hoppers shall be approved by the Engineer and shall provide means of regulating the flow of aggregates into the batch box so that the required and exact weight of aggregates can be readily obtained.

610-3.5 CONSISTENCY. The consistency of the concrete shall be checked by the slump test specified in ASTM C 143.

610-3.6 MIXING. Concrete may be mixed at the construction site, at a central point, or wholly or in part in truck mixers. The concrete shall be mixed and delivered in accordance with the requirements of ASTM C 94.

610-3.7 MIXING CONDITIONS. The concrete shall be mixed only in quantities required for immediate use. Concrete shall not be mixed while the air temperature is below 40 °F (4 °C) without permission of the Engineer. If permission is granted for mixing under such conditions, aggregates or water, or both, shall be heated and the concrete shall be placed at a temperature not less than 50 °F (10 °C) nor more than 100 °F (38 °C). The Contractor shall be held responsible for any defective work, resulting from freezing or injury in any manner during placing and curing, and shall replace such work at his/her expense.

Retempering of concrete by adding water or any other material shall not be permitted.

The delivery of concrete to the job shall be in such a manner that batches of concrete will be deposited at uninterrupted intervals.

610-3.8 FORMS. Concrete shall not be placed until all the forms and reinforcements have been inspected and approved by the Engineer. Forms shall be of suitable material and shall be of the type, size, shape, quality, and strength to build the structure as designed on the plans. The forms shall be true to line and grade and shall be mortar-tight and sufficiently rigid to prevent displacement and sagging between supports. The Contractor shall bear responsibility for their adequacy. The surfaces of forms shall be smooth and free from irregularities, dents, sags, and holes.

The internal ties shall be arranged so that, when the forms are removed, no metal will show in the concrete surface or discolor the surface when exposed to weathering. All forms shall be wetted with water or with a non-staining mineral oil, which shall be applied shortly before the concrete is placed. Forms shall be constructed so that they can be removed without injuring the concrete or concrete surface. The forms shall not be removed before the expiration of at least 30 hours from vertical faces, walls, slender columns, and similar structures; forms supported by falsework under slabs, beams, girders, arches, and similar construction shall not be removed until tests indicate that at least 60% of the design strength of the concrete has developed.

610-3.9 PLACING REINFORCEMENT. All reinforcement shall be accurately placed, as shown on the plans, and shall be firmly held in position during concreting. Bars shall be fastened together at intersections. The reinforcement shall be supported by approved metal chairs. Shop drawings, lists, and bending details shall be supplied by the Contractor when required.

610-3.10 EMBEDDED ITEMS. Before placing concrete, any items that are to be embedded shall be firmly and securely fastened in place as indicated. All such items shall be clean and free from coating, rust, scale, oil, or any foreign matter. The embedding of wood shall be avoided. The concrete shall be spaded and consolidated around and against embedded items.

610-3.11 PLACING CONCRETE. All concrete shall be placed during daylight, unless otherwise approved. The concrete shall not be placed until the depth and character of foundation, the adequacy of forms and falsework, and the placing of the steel reinforcing have been approved. Concrete shall be placed as soon as practical after mixing and in no case later than 1 hour after water has been added to the mix. The method and manner of placing shall be such to avoid segregation and displacement of the reinforcement. Troughs, pipes, and chutes shall be used as an aid in placing concrete when necessary. Dropping the concrete a distance of more than 5 ft (1.5 m), or depositing a large quantity at one point, will not be permitted. Concrete shall be placed upon clean, damp surfaces, free from running water, or upon properly consolidated soil.

The concrete shall be compacted with suitable mechanical vibrators operating within the concrete. When necessary, vibrating shall be supplemented by hand spading with suitable tools to assure proper and adequate compaction. Vibrators shall be manipulated so as to work the concrete thoroughly around the reinforcement and embedded fixtures and into corners and angles of the forms. The vibration at any joint shall be of sufficient duration to accomplish compaction but shall not be prolonged to the point where segregation occurs. Concrete deposited under water shall be carefully placed in a compact mass in its final position by means of a tremie, a closed bottom dump bucket, or other approved method and shall not be disturbed after being deposited.

610-3.12 CONSTRUCTION JOINTS. When the placing of concrete is suspended, necessary provisions shall be made for joining future work before the placed concrete takes its initial set. For the proper bonding of old and new

concrete, such provisions shall be made for grooves, steps, keys, dovetails, reinforcing bars or other devices as may be prescribed. The work shall be arranged so that a section begun on any day shall be finished during daylight of the same day. Before depositing new concrete on or against concrete that has hardened, the surface of the hardened concrete shall be cleaned by a heavy steel broom, roughened slightly, wetted, and covered with a neat coating of cement paste or grout.

610-3.13 EXPANSION JOINTS. Expansion joints shall be constructed at such points and of such dimensions as may be indicated on the drawings. The premolded filler shall be cut to the same shape as that of the surfaces being joined. The filler shall be fixed firmly against the surface of the concrete already in place in such manner that it will not be displaced when concrete is deposited against it.

610-3.14 DEFECTIVE WORK. Any defective work discovered after the forms have been removed shall be immediately removed and replaced. If any dimensions are deficient, or if the surface of the concrete is bulged, uneven, or shows honeycomb, which in the opinion of the Engineer cannot be repaired satisfactorily, the entire section shall be removed and replaced at the expense of the Contractor.

610-3.15 SURFACE FINISH. All exposed concrete surfaces shall be true, smooth, and free from open or rough spaces, depressions, or projections. The concrete in horizontal plane surfaces shall be brought flush with the finished top surface at the proper elevation and shall be struck-off with a straightedge and floated. Mortar finishing shall not be permitted, nor shall dry cement or sand-cement mortar be spread over the concrete during the finishing of horizontal plane surfaces.

When directed, the surface finish of exposed concrete shall be a rubbed finish. If forms can be removed while the concrete is still green, the surface shall be pointed and wetted and then rubbed with a wooden float until all irregularities are removed. If the concrete has hardened before being rubbed, a carborundum stone shall be used to finish the surface. When approved, the finishing can be done with a rubbing machine.

610-3.16 CURING AND PROTECTION. All concrete shall be properly cured and protected by the Contractor. The work shall be protected from the elements, flowing water, and from defacement of any nature during the building operations. The concrete shall be cured as soon as it has sufficiently hardened by covering with an approved material. Water-absorptive coverings shall be thoroughly saturated when placed and kept saturated for a period of at least 3 days. All curing mats or blankets shall be sufficiently weighted or tied down to keep the concrete surface covered and to prevent the surface from being exposed to currents of air. Where wooden forms are used, they shall be kept wet at all times until removed to prevent the opening of joints and drying out of the concrete. Traffic shall not be allowed on concrete surfaces for 7 days after the concrete has been placed.

610-3.17 DRAINS OR DUCTS. Drainage pipes, conduits, and ducts that are to be encased in concrete shall be installed by the Contractor before the concrete is placed. The pipe shall be held rigidly so that it will not be displaced or moved during the placing of the concrete.

610-3.18 COLD WEATHER PROTECTION. When concrete is placed at temperatures below 40 °F (4 °C), the Contractor shall provide satisfactory methods and means to protect the mix from injury by freezing. The aggregates, or water, or both, shall be heated in order to place the concrete at temperatures between 50 °F and 100 °F (10 °C and 38 °C).

Calcium chloride may be incorporated in the mixing water when directed by the Engineer. Not more than 2 pounds (908 grams) of Type 1 nor more than 1.6 pounds (726 grams) of Type 2 shall be added per bag of cement. After the concrete has been placed, the Contractor shall provide sufficient protection such as cover, canvas, framework, heating apparatus, etc., to enclose and protect the structure and maintain the temperature of the mix at not less than 50 °F (10 °C) until at least 60% of the designed strength has been attained.

610-3.19 FILLING JOINTS. All joints that require filling shall be thoroughly cleaned, and any excess mortar or concrete shall be cut out with proper tools. Joint filling shall not be started until after final curing and shall be done only when the concrete is completely dry. The cleaning and filling shall be carefully done with proper equipment and in a manner to obtain a neat looking joint free from excess filler.

METHOD OF MEASUREMENT

610-4.1 Portland cement concrete, steel reinforcement and incidental items specified shall not be measured for payment. Portland cement concrete, steel reinforcement and incidental items specified shall be paid for under the item requiring the concrete.

BASIS OF PAYMENT

610-5.1 Payment shall be made under the item requiring the Portland cement concrete, steel reinforcement and incidental items specified.

TESTING REQUIREMENTS

ASTM C 31	Making and Curing Test Specimens in the Field
ASTM C 39	Compressive Strength of Cylindrical Concrete Specimens
ASTM C 136	Sieve Analysis of Fine and Coarse Aggregates
ASTM C 138	Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
ASTM C 143	Slump of Hydraulic Cement Concrete
ASTM C 231	Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 666	Resistance of Concrete to Rapid Freezing and Thawing
ASTM C 1077	Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
ASTM C 1260	Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)

MATERIAL REQUIREMENTS

ASTM A 184	Specification for Fabricated Deformed Steel Bar or Rod Mats for Concrete Reinforcement
ASTM A 185	Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
ASTM A 497	Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement
ASTM A 615	Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM A 704	Welded Steel Plain Bars or Rod Mats for Concrete Reinforcement
ASTM C 33	Concrete Aggregates
ASTM C 94	Ready-Mixed Concrete
ASTM C 150	Portland Cement
ASTM C 171	Sheet Materials for Curing Concrete
ASTM C 172	Sampling Freshly Mixed Concrete
ASTM C 260	Air-Entraining Admixtures for Concrete
ASTM C 309	Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C 494	Chemical Admixtures for Concrete
ASTM C 595	Blended Hydraulic Cements
ASTM C 618	Coal Flyash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
ASTM D 1751	Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)
ASTM D 1752	Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
AASHTO T 26	Quality of Water to be Used in Concrete

END OF ITEM P-610

ITEM P- 620
RUNWAY AND TAXIWAY PAINTING

CONTRACT DOCUMENTS

620-0.1 This section of these specifications is a part of the Contract Documents as defined in the Contract Articles. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other sections.

Attention shall be directed to the sections of these specifications entitled, "Summary of Work and Special Work Requirements" and "Supplemental Contract Articles".

DESCRIPTION

620-1.1 This item shall consist of the painting of numbers, markings, and stripes on the surface of runways, taxiways, and aprons, in accordance with these specifications and at the locations shown on the plans, or as directed by the Engineer.

MATERIALS

620-2.1 MATERIALS ACCEPTANCE. The Contractor shall furnish manufacturer's certified test reports for materials shipped to the project. The certified test reports shall include a statement that the materials meet the specification requirements. The reports can be used for material acceptance or the Engineer may perform verification testing. The reports shall not be interpreted as a basis for payment. The Contractor shall notify the Engineer upon arrival of a shipment of materials to the site.

620-2.2 PAINT. Paint shall be Waterborne, in accordance with the requirements of paragraph 620-2.2a. Paint shall be furnished in White – 37925, Yellow - 33538 or 33655, Black - 37038 in accordance with Federal Standard No. 595. Waterborne black paint should be used under permanent applications to outline a border at least 6 inches wide around markings on all light colored pavements, all PCC pavements, and all existing pavements regardless of material.

a. WATERBORNE. Paint shall meet the requirements of Federal Specification TT-P-1952E, Type II.

620-2.3 REFLECTIVE MEDIA. Glass beads shall meet the requirements for Federal Specification. TT-B-1325D, Type I, gradation A. Glass beads shall be treated with all compatible coupling agents specified by the manufacturers of the paint and reflective media to ensure adhesion, embedment and/or flotation.

CONSTRUCTION METHODS

620-3.1 WEATHER LIMITATIONS. The painting shall be performed only when the surface is dry and when the surface temperature is at least 45°F and rising and the pavement surface temperature is at least 5°F above the dew point. Painting operations shall be discontinued when the surface temperature exceeds the manufacturer's recommendations. Markings shall not be applied when the pavement temperature is greater than 120°F.

620-3.2 EQUIPMENT. Equipment shall include the apparatus necessary to properly clean the existing surface, a mechanical marking machine, a bead dispensing machine, and such auxiliary hand-painting equipment as may be necessary to satisfactorily complete the job.

The mechanical marker shall be an atomizing spray-type or airless-type marking machine suitable for application of traffic paint. It shall produce an even and uniform film thickness at the required coverage and shall apply markings of uniform cross-sections and clear-cut edges without running or spattering and without over spray.

620-3.3 PREPARATION OF SURFACE. Immediately before application of the paint, the surface shall be dry and free from dirt, grease, oil, laitance, or other foreign material that would reduce the bond between the paint and the pavement. The area to be painted shall be cleaned by sweeping and blowing or by other methods as required

to remove all dirt, laitance, and loose materials without damage to the pavement surface. Use of any chemicals or impact abrasives during surface preparation shall be approved in advance by the Engineer. Paint shall not be applied to Portland cement concrete pavement until the areas to be painted are clean of curing material. Sandblasting or high-pressure water shall be used to remove curing materials.

620-3.4 LAYOUT OF MARKINGS. The proposed markings shall be laid out in advance of the paint application. The locations of markings to receive glass beads shall be as listed below.

a. Glass beads improve conspicuity and the friction characteristics of markings. The following PERMANENT MARKING locations shall receive glass beads:

1. All markings (with the exception of black outlines)

620-3.5 APPLICATION. Paint shall be applied at the locations and to the dimensions and spacing shown on the plans. Paint shall not be applied until the layout and condition of the surface has been approved by the Engineer. The edges of the markings shall not vary from a straight line more than 1/2 inch in 50 feet and marking dimensions and spacings shall be within the following tolerances:

Dimension and Spacing	Tolerance
36 inches or less	±1/2 inch
greater than 36 inches to 6 feet	± 1 inch
greater than 6 feet to 60 feet	± 2 inches
greater than 60 feet	± 3 inches

The paint shall be mixed in accordance with the manufacturer's instructions and applied to the pavement with a marking machine at the rate(s) shown in Table 1. The addition of thinner will not be permitted. A minimum of 48 hours shall elapse between placement of a bituminous surface course or seal coat and application of temporary paint, unless directed by the Engineer. A minimum of 30 days (cure time) shall elapse between placement of a bituminous surface course and application of the final coat of paint, unless directed by the Engineer.

The Contractor shall anticipate that each phase will require a separate mobilization. Temporary paint shall be applied if areas are to be opened to aircraft operations. Permanent paint may be applied after the required cure time for the bituminous pavement has elapsed. The contractor shall consider curing time in their overall schedule.

TABLE 1. APPLICATION RATES FOR PAINT AND GLASS BEADS

Paint Type	Paint Square feet per gallon ft ² /gal.	Glass Beads, Type I, Gradation A Pounds per gallon of paint lb. /gal.
Waterborne	115 ft ² /gal. maximum	7 lb. /gal. minimum

Glass beads shall be distributed upon the marked areas at the locations shown on the plans to receive glass beads immediately after application of the paint. A dispenser shall be furnished that is properly designed for attachment to the marking machine and suitable for dispensing glass beads. Glass beads shall be applied at the rate(s) shown in Table 1. Glass beads shall not be applied to black paint. Glass beads shall adhere to the cured paint or all marking operations shall cease until corrections are made.

The Engineer may direct the Contractor to install the temporary paint at 50 percent of the application rate as specified in Table 1. The Engineer shall direct a test area of up to 100 square feet of temporary paint in order to determine the reduced application rate. Payment for temporary paint shall be reduced in direct proportion to the reduced application rate. 100 percent payment shall be based on the application rate specified in Table 1. Temporary markings lightly applied and made with dilute paint, normally do not have to be removed prior to placing the next bituminous overlay course.

All emptied containers shall be returned to the paint storage area for checking by the Engineer. The containers shall not be removed from the airport or destroyed until authorized by the Engineer.

620-3.6 Protection. After application of the paint, all markings shall be protected from damage until the paint is dry. All surfaces shall be protected from excess moisture and/or rain and from disfiguration by spatter, splashes, spillage, or drippings of paint.

620-3.7 Removal. The contractor shall remove existing paint markings as called for on the plans or as directed by the engineer. Paint will not be removed in areas indicated for the pavement to milled or removed. Acceptable removal methods shall be non-destructive and completely remove the markings from the existing surface. Acceptable methods include: water blasting, sand blasting or micro-surface grinding. Methods shall not pull aggregate from the pavement surface, shall leave a smooth finished surface, and shall not leave impressions greater than 1/16-inch. Painting over existing markings with black or similar color paint to obscure the markings shall not be allowed.

METHOD OF MEASUREMENT

620-4.1 Permanent Paint Markings. The quantity of permanent runway and taxiway markings to be paid for shall be the number of square feet of painting and the number of pounds of reflective media, one complete item in place performed in accordance with the specifications and accepted by the Engineer.

620-4.2 Temporary Paint Markings. The quantity of temporary runway and taxiway markings to be paid for shall be the number of square feet of painting in place performed in accordance with the specifications and accepted by the Engineer. Only temporary paint markings for the newly constructed Taxiway A1 shall be paid for and only if the realignment of Taxiway A immediately follows. Under these circumstances, project phasing requires Taxiway A1 to be opened immediately as Taxiway A is realigned. Any other temporary markings shall not be paid for rather shall be considered in the contractors construction schedule and work phasing unless specifically called for in the plans.

620-4.3 Reflective Media. The quantity of reflective media to be paid for shall not be measured separately but shall be considered incidental Item P-620-1 or P-620-2.

620-4.4 Paint Marking Removal. The quantity of paint marking removal to be paid for shall be the actual number of square feet of existing paint markings removed, as shown on the plans or as directed by the engineer, measured in place prior to removal.

BASIS OF PAYMENT

620-5.1 Payment shall be made at the respective contract price per square foot for runway and taxiway painting including reflective media (if required) as stated in 620-4.1 and 4.2. This price shall be full compensation for furnishing all materials and for all labor, equipment, tools, and incidentals necessary to complete the item.

620-5.2 Payment shall be made at the respective contract price per square foot for runway and taxiway paint markings removed and accepted. This price shall be full compensation for furnishing all materials and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-620-1	Permanent Paint Markings	per square foot
Item P-620-2	Temporary Paint Markings	per square foot
Item P-620-3	Paint Marking Removal	per square foot

TESTING REQUIREMENTS

ASTM C 136	Sieve Analysis of Fine and Coarse Aggregates
ASTM C 146	Chemical Analysis of Glass Sand

ASTM C 371	Wire-Cloth Sieve Analysis of Nonplastic Ceramic Powders
ASTM D 92	Test Method for Flash and Fire Points by Cleveland Open Cup
ASTM D 711	No-Pick-Up Time of Traffic Paint
ASTM D 968	Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive
ASTM D 1213-54(1975)	Test Method for Crushing Resistance of Glass Spheres
ASTM D 1652	Test Method for Epoxy Content of Epoxy Resins
ASTM D 2074	Test Method for Total Primary, Secondary, and Tertiary Amine Values of Fatty Amines by Alternative Indicator Method
ASTM D 2240	Test Method for Rubber Products-Durometer Hardness
ASTM G 15453	Operating Light and Water-Exposure Apparatus (Fluorescent Light Apparatus UV-Condensation Type) for Exposure of Nonmetallic Materials.
Federal Test Method Standard No. 141D/GEN	Paint, Varnish, Lacquer and Related Materials; Methods of Inspection, Sampling and Testing

MATERIAL REQUIREMENTS

ASTM D 476	Specifications for Dry Pigmentary Titanium Dioxide Pigments Products
Code of Federal Regulations	40 CFR Part 60, Appendix A – Definition of Traverse Point Number and Location
Code of Federal Regulations	29 CFR Part 1910.1200 – Hazard Communications
FED SPEC TT-B-1325D	Beads (Glass Spheres) Retroreflective
AASHTO M 247	Glass Beads Used in Traffic Paints
FED SPEC TT-P-1952E	Paint, Traffic and Airfield Marking, Waterborne
Commercial Item Description (CID) A-A-2886B	Paint, Traffic, Solvent Based
FED STD 595	Colors used in Government Procurement

END OF ITEM P-620

ITEM D-701
PIPE FOR STORM DRAINS

CONTRACT DOCUMENTS

701-0.1 This section of these specifications is a part of the Contract Documents as defined in the Contract Articles. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other sections.

Attention shall be directed to the sections of these specifications entitled, "Summary of Work and Special Work Requirements" and "Supplemental Contract Articles".

DESCRIPTION

701-1.1 This item shall consist of the construction of pipe culverts in accordance with these specifications and in reasonably close conformity with the lines and grades shown on the plans.

MATERIALS

701-2.1 Materials shall meet the requirements shown on the plans and specified below. Prior to delivery to the site, the Contractor shall submit certified test reports to the Engineer for those materials proposed for use during construction to include bedding and backfill. The certification shall show the appropriate ASTM test(s) for each material, the test results, and a statement that the material passed or failed.

701-2.2 REINFORCED CONCRETE PIPE. Reinforced Concrete Pipe shall conform to the requirements of ASTM C 76, Reinforced Concrete Pipe and shall be Class V. Size of pipe shall be as indicated on the Contract drawings.

701-2.3 PLASTIC PIPE. Plastic pipe shall be dual wall polyethylene pipe meeting the requirements ASTM F 2648. Plastic pipe shall have a smooth interior and be perforated. Perforations shall meet the requirements of AASHTO M294, Class II.

701-2.4 CONCRETE. Concrete for pipe cradles shall have a minimum compressive strength of 2,000 psi at 28 days and conform to the requirements of ASTM C 94.

701-2.5 RUBBER GASKETS. Rubber gaskets for rigid pipe shall conform to the requirements of ASTM C 443. Rubber gaskets for PVC pipe and polyethylene pipe shall conform to the requirements of ASTM F 477. Rubber gaskets for zinc-coated steel pipe and pre-coated galvanized pipe shall conform to the requirements of ASTM D 1056, for the "RE" closed cell grades.

701-2.6 JOINT MORTAR. Pipe joint mortar shall consist of one part portland cement and two parts sand. The portland cement shall conform to the requirements of ASTM C 150, Type I. The sand shall conform to the requirements of ASTM C 144.

701-2.7 JOINT FILLERS. Poured filler for joints shall conform to the requirements of ASTM D 1190.

701-2.8 PLASTIC GASKETS. Plastic gaskets shall conform to the requirements of AASHTO M 198 (Type B).

701-2.9 CONTROLLED LOW STRENGTH MATERIAL (CLSM). Controlled low strength material shall conform to the requirements of Item P-153. When CLSM is used all joints shall have gaskets

CONSTRUCTION METHODS

701-3.4 EXCAVATION. The width of the pipe trench shall be sufficient to permit satisfactory jointing of the pipe and thorough tamping of the bedding material under and around the pipe, but it shall not be less than the external diameter of the pipe plus 6 inches on each side. The trench walls shall be approximately vertical.

Where rock, hardpan, or other unyielding material is encountered, the Contractor shall remove it from below the foundation grade for a depth of at least 12 inches or one-half inch for each foot of fill over the top of the pipe (whichever is greater) but for no more than three-quarters of the nominal diameter of the pipe. The width of the excavation shall be at least 1 foot greater than the horizontal outside diameter of the pipe. The excavation below grade shall be backfilled with selected fine compressible material, such as silty clay or loam, and lightly compacted in layers not over 6 inches in uncompacted depth to form a uniform but yielding foundation.

Where a firm foundation is not encountered at the grade established, due to soft, spongy, or other unstable soil, the unstable soil shall be removed and replaced with approved granular material for the full trench width. The Engineer shall determine the depth of removal necessary. The granular material shall be compacted to provide adequate support for the pipe.

The excavation for pipes that are placed in embankment fill shall not be made until the embankment has been completed to a height above the top of the pipe as shown on the plans.

Excavation, other than rock excavation, shall not be measured and paid for separately, but rather, it shall be included in the unit bid price for the pipe.

The contractor shall be responsible for all shoring, bracing, or sheathing necessary to implement and protect the excavation and any new or existing structures and utilities as required for safety or conformance to governing laws.

The cost of installing, maintaining and removing all bracing, sheathing, or shoring shall be included in the unit bid price for the pipe.

701-3.4 BEDDING. The pipe bedding shall conform to the class specified on the plans. When no bedding class is specified or detailed on the plans, the requirements for Class B bedding shall apply.

a. Rigid Pipe. Class A bedding shall consist of a continuous concrete cradle conforming to the plan details.

Class B bedding shall consist of a bed of granular material having a thickness of at least 6 inches below the bottom of the pipe and extending up around the pipe for a depth of not less than 50 percent of the pipe's vertical outside diameter. The layer of bedding material shall be shaped to fit the pipe for at least 10 percent of the pipe's vertical diameter and shall have recesses shaped to receive the bell of bell and spigot pipe. The bedding material shall be sand or selected sandy soil, all of which passes a 3/8 inch sieve and not more than 10 percent of which passes a No. 200 sieve.

Class C bedding shall consist of bedding the pipe in its natural foundation to a depth of not less than 10 percent of the pipe's vertical outside diameter. The bed shall be shaped to fit the pipe and shall have recesses shaped to receive the bell of bell and spigot pipe.

b. Flexible Pipe. For flexible pipe, the bed shall be roughly shaped to fit the pipe, and a bedding blanket of sand or fine granular material shall be provided as follows:

Pipe Corrugation Depth Inches (in.)	Minimum Bedding Depth Inches (in.)
1/2	1
1	2
2	2-1/2
2-1/2	3-1/2

c. PVC and Polyethylene Pipe. For PVC and polyethylene pipe, the bedding material shall consist of clean, washed, uniform angular crushed No. 3 (AASHTO M43) stone. The bedding dimensions shall be as shown on the contract drawings.

Bedding shall not be measured and paid for separately, but rather, shall be included in the unit bid price for the pipe.

701-3.3 GEOTEXTILE. Geotextile fabric shall conform to the requirements of AASHTO M 288-99, Class 2. The fabric shall meet the following requirements:

<u>Fabric Property</u>	<u>Test Method</u>	<u>Property Requirement</u>
Grab Tensile Strength (lbs)	ASTM D 4632	125 Minimum
Grab Tensile Elongation (%)	ASTM D 4632	50 Maximum
Puncture Strength (lbs)	ASTM D 4833	40 Minimum
Trapezoid Tear Strength (lbs)	ASTM D 4533	55 Minimum
Apparent Opening Size (US Sieve)	ASTM D 4751	70-100
Permittivity (Sec -1)	ASTM D 4491	0.8 Minimum
Ultraviolet Degradation (% Retained Strength)	ASTM D 4355	70 @500 Hrs Minimum

701-3.4 LAYING PIPE. The pipe laying shall begin at the lowest point of the trench and precede upgrade. The lower segment of the pipe shall be in contact with the bedding throughout its full length. Bell or groove ends of rigid pipes and outside circumferential laps of flexible pipes shall be placed facing upgrade.

Paved or partially lined pipe shall be placed so that the longitudinal center line of the paved segment coincides with the flow line.

Elliptical and elliptically reinforced pipes shall be placed with the manufacturer's top of pipe mark within five degrees of a vertical plane through the longitudinal axis of the pipe.

All pipes shall be handled in a manner to avoid any damage. The interior of all pipe and accessories shall be kept free from dirt and foreign matter at all times.

All pipes shall be laid to conform to the lines and grades shown on the contract drawings or as directed by the engineer. The pipe shall be bedded as specified or as shown in the contract drawings. Pipe shall not be supported on blocking, wedges, brick or any material other than bedding material.

701-3.4 JOINING PIPE. Joints shall be made with (1) portland cement mortar, (2) portland cement grout, (3) rubber gaskets, (4) plastic gaskets, or (5) coupling bands.

Unless specified otherwise, joints shall be made with rubber ring gaskets and shall be installed to form a flexible watertight seal.

Mortar joints shall be made with an excess of mortar to form a continuous bead around the outside of the pipe and shall be finished smooth on the inside. Molds or runners shall be used for grouted joints in order to retain the poured grout.

a. Concrete Pipe. Concrete pipe may be either bell and spigot or tongue and groove. The method of joining pipe sections shall be such that the ends are fully entered and the inner surfaces are reasonably flush and even. Joints shall be thoroughly wetted before mortar or grout is applied.

b. Metal Pipe. Metal pipe shall be firmly joined by form fitting bands conforming to the requirements of ASTM A 760 for steel pipe and AASHTO M 196 for aluminum pipe.

c. PVC and Polyethylene Pipe. Joints for PVC and Polyethylene pipe shall conform to the requirements of ASTM D 3212 when water tight joints are required. Joints for PVC and Polyethylene pipe shall conform to the requirements of AASHTO M 304 when soil tight joints are required. Fittings for polyethylene pipe shall conform to the requirements of AASHTO M 252 or M 294M.

701-3.4 BACKFILLING. Pipes shall be inspected before any backfill is placed; any pipes found to be out of alignment, unduly settled, or damaged shall be removed and relaid or replaced at the Contractor's expense.

Material for backfill shall be fine, readily compatible soil, granular material selected from the excavation, a source of the Contractor's choosing, or shall meet the requirements of Item P-153. It shall not contain frozen lumps, stones that would be retained on a 2-inch sieve, chunks of highly plastic clay, or other objectionable material. No less than 95 percent of a granular backfill material shall pass through a 1/2 inch sieve, and no less than 95 percent of it shall be retained on a No. 4 sieve.

When the top of the pipe is even with or below the top of the trench, the backfill shall be compacted in layers not exceeding 6 inches on both sides of the pipe and shall be brought up one foot above the top of the pipe or to natural ground level, whichever is greater. Care shall be exercised to thoroughly compact the backfill material under the haunches of the pipe. Material shall be brought up evenly on both sides of the pipe.

When the top of the pipe is above the top of the trench, the backfill shall be compacted in layers not exceeding 6 inches and shall be brought up evenly on both sides of the pipe to 1 foot above the top of the pipe. The width of backfill on each side of the pipe for the portion above the top of the trench shall be equal to twice the pipe's diameter of 12 feet, whichever is less.

For PVC and polyethylene pipe, the backfill shall be placed in two stages; first to the top of the pipe and then at least 12 inches over the top of the pipe. The backfill material shall meet the requirements of paragraph 701-3.2c.

All backfill shall be compacted to the density required under Item P-152.

Backfill shall not be measured or paid for separately but rather shall be included in the unit bid price for the pipe.

METHOD OF MEASUREMENT

701-4.1 PIPE FOR STORM DRAINS. The length of pipe shall be measured in linear feet of pipe in place, completed, and approved. It shall be measured along the centerline of the pipe from end or inside face of structure to the end or inside face of structure, whichever is applicable. The several classes, types and size shall be measured separately. All fittings shall be included in the footage as typical pipe sections in the pipe being measured.

BASIS OF PAYMENT

701-5.1 Payment will be made at the contract unit price per linear foot for each kind of pipe of the type and size designated. All fittings shall be included in the footage as typical pipe sections. These prices shall fully compensate the Contractor for furnishing all materials and for all preparation, shoring, bedding, stone, geotextile, excavation, backfill and installation of these materials; and for all labor, equipment, tools, and incidentals necessary to complete the item.

The contractor's attention is directed to the basis of payment section above: Please note that all stone and geotextile installed around perforated pipe shall not be measured separately for payment rather the cost shall be included in the unit price for perforated HDPE pipe. Reference contract drawings for details.

Payment will be made under:

Item D-701-1	12 inch Reinforced Concrete Pipe (Class V)	per linear foot
Item D-701-2	12 inch Perforated HDPE Pipe	per linear foot
Item D-701-3	36 inch Reinforced Concrete Pipe (Class V)	per linear foot

Item D-701-4 36 inch Perforated HDPE Pipe per linear foot

MATERIAL REQUIREMENTS

ASTM C 76	Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C 94	Ready Mixed Concrete
ASTM C 144	Aggregate for Masonry Mortar
ASTM C 150	Portland Cement
ASTM D 3212	Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D 6690	Joint and Crack Sealants, Hot-Applied, for Concrete and Asphalt Pavements
ASTM F 477	Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F 2736	Standard Specification for 6 to 30 in. (152 To 762 mm) Polypropylene (PP) Corrugated Single Wall Pipe And Double Wall Pipe
ASTM F 2881	Standard Specification for 12 to 60 in. [300 to 1500 mm] Polypropylene (PP) Dual Wall Pipe and Fittings for Non-Pressure Storm Sewer Applications
AASHTO M 190	Bituminous-Coated Corrugated Metal Culvert Pipe and Pipe Arches
AASHTO M 198	Joints for Circular Concrete Sewer and Culvert Pipe Using Flexible Watertight Gaskets
AASHTO M 288	Geotextile Specification for Highway Applications

END ITEM D-701

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ITEM D-751
MANHOLES, CATCH BASINS AND INLETS

CONTRACT DOCUMENTS

751-0.1 This section of these specifications is a part of the Contract Documents as defined in the Contract Articles. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other sections.

Attention shall be directed to the sections of these specifications entitled, "Summary of Work and Special Work Requirements" and "Supplemental Contract Articles".

DESCRIPTION

751-1.1 This item shall consist of construction of manholes, catch basins, and inlets, in accordance with these specifications, at the specified locations and conforming to the lines, grades, and dimensions shown on the plans or required by the Engineer.

MATERIALS

751-2.1 MATERIAL ACCEPTANCE Prior to the delivery to the site, the Contractor shall submit certified test reports, (and design calculations as required) to the Engineer for those materials proposed for use during construction. The certification shall show the appropriate ASTM test(s) for each material, the test results, and a statement that the material passed or failed.

751-2.2 BRICK. The brick shall conform to the requirements of ASTM C 32, Grade SM.

751-2.3 MORTAR. Mortar shall consist of one part portland cement and two parts sand. The portland cement shall conform to the requirements of ASTM C 150, Type I. The sand shall conform to the requirements of ASTM C 144.

751-2.4 CONCRETE. Plain and reinforced concrete used in structures, headwall, connections of pipes with structures, and the support of structures or frames shall conform to the requirements of Section P-610 of these specifications.

751-2.5 PRECAST CONCRETE STRUCTURES. Precast concrete structures including but not limited to manholes, catch basins, and inlets shall conform to the requirements of ASTM C 478. Structures shall be designed in accordance with Appendix 3 of FAA Advisory Circular 150/5320-6E and shall be capable of supporting a Boeing 727 with a maximum takeoff weight of 210,000 pounds. Shop drawings shall be submitted to the engineer with the signature and stamp of a registered professional engineer licensed in the State of New Hampshire. Shop drawings shall include details of reinforcing, certification of load capacity, and state conformance with ASTM C 478.

751-2.6 PIPE HOODS. Pipe hoods shall be constructed from HDPE water tight flow control elbows manufactured by ADS or Round Snouts as manufactured by Best Management Products Inc. or approved equal.

751-2.7 BUTYL RESIN SEALANT. The tongue and groove of precast concrete structures shall be formed so as to receive a butyl resin sealant, Con Seal CS-102 or CS-202 as manufactured by Concrete Sealants, Inc., or approved equal. Butyl resin sealant shall conform to Federal Specification SS-S-210A and AASHTO M-198B.

751-2.8 PIPE CONNECTORS. Entry pipe connectors for precast structures shall be A-Lok, Kor-N-Seal or approved equal manufactured in accordance with ASTM C-923.

751-2.9 CORRUGATED METAL. Corrugated metal shall conform to the requirements of AASHTO M 36.

751-2.10 FRAMES, COVERS, AND GRATES. The castings shall conform to one of the following requirements:

- a. Gray iron castings shall meet the requirements of ASTM A 48, Class 30B and 35B.

- b. Malleable iron castings shall meet the requirements of ASTM A 47.
- c. Steel castings shall meet the requirements of ASTM A 27.
- d. Structural steel for grates and frames shall conform to the requirements of ASTM A 283, Grade D.
- e. Ductile iron castings shall conform to the requirements of ASTM A 536.
- f. Austempered ductile iron castings shall conform to the requirements of ASTM A 897.

All castings (frames, covers and grates) shall be capable of supporting 100,000 lb. wheel loads with 250psi tire pressure. Each frame and cover or grate unit shall be provided with fastening members to prevent it from being dislodged by traffic but which will allow easy removal for access to the structure.

All castings shall be thoroughly cleaned. After fabrication, structural steel units shall be galvanized to meet the requirements of ASTM A 123.

751-2.11 STEPS. The steps or ladder bars shall be gray or malleable cast iron or galvanized steel. The steps shall be the size, length, and shape shown on the plans and those steps that are not galvanized shall be given a coat of bituminous paint, when directed.

CONSTRUCTION METHODS

751-3.1 UNCLASSIFIED EXCAVATION.

a. The Contractor shall do all excavation for structures and structure footings to the lines and grades or elevations, shown on the plans, or as staked by the Engineer. The excavation shall be of sufficient size to permit the placing of the full width and length of the structure or structure footings shown. The elevations of the bottoms of footings, as shown on the plans, shall be considered as approximately only; and the Engineer may order, in writing, changes in dimensions or elevations of footings necessary to secure a satisfactory foundation.

b. Boulders, logs, or any other objectionable material encountered in excavation shall be removed. All rock or other hard foundation material shall be cleaned of all loose material and cut to a firm surface either level, stepped, or serrated, as directed by the Engineer. All seams or crevices shall be cleaned out and grouted. All loose and disintegrated rock and thin strata shall be removed. When concrete is to rest on a surface other than rock, special care shall be taken not to disturb the bottom of the excavation, and excavation to final grade shall not be made until just before the concrete or reinforcing is to be placed.

c. The Contractor shall do all bracing, sheathing, or shoring necessary to implement and protect the excavation and the structure as required for safety or conformance to governing laws. The cost of bracing, sheathing, or shoring shall be included in the unit price bid for the structure.

d. Unless otherwise provided, bracing, sheathing, or shoring involved in the construction of this item shall be removed by the Contractor after the completion of the structure. Removal shall be effected in a manner that will not disturb or mar finished masonry. The cost of removal shall be included in the unit price bid for the structure.

e. After each excavation is completed, the Contractor shall notify the Engineer to that effect; and concrete or reinforcing steel shall be placed after the Engineer has approved the depth of the excavation and the character of the foundation material.

f. No excavation shall be measured for direct payment. Performance of this work shall be included in the unit bid price for each structure.

751-3.2 BRICK STRUCTURES.

a. **Foundations.** A prepared foundation shall be placed for all brick structures after the foundation excavation is completed and accepted. Unless otherwise specified, the base shall consist of reinforced concrete mixed, prepared, and placed in accordance with the requirements of Item P-610.

b. Laying Brick. All brick shall be clean and thoroughly wet before laying so that they will not absorb any appreciable amount of additional water at the time they are laid. All brick shall be laid in freshly made mortar. Mortar that is not used within 45 minutes after water has been added shall be discarded. Retempering of mortar shall not be permitted. An ample layer of mortar shall be spread on the beds and a shallow furrow shall be made in it that can be readily closed by the laying of the brick. All bed and head joints shall be filled solid with mortar. End joints of stretchers and side or cross joints of headers shall be fully buttered with mortar and a shoved joint made to squeeze out mortar at the top of the joint. Any bricks that may be loosened after the mortar has taken its set, shall be removed, cleaned, and relaid with fresh mortar. No broken or chipped brick shall be used in the face, and no spalls or bats shall be used except where necessary to shape around irregular openings or edges; in which case, full bricks shall be placed at ends or corners where possible, and the bats shall be used in the interior of the course. In making closures, no piece of brick shorter than the width of a whole brick shall be used; and wherever practicable, whole brick shall be used and laid as headers.

c. Joints. All joints shall be slushed with mortar at every course, but slushing alone will not be considered adequate for making an acceptable joint. Exterior faces shall be laid up in advance of backing. Exterior faces shall be back plastered or parge with a coat of mortar not less than 3/8-inch thick before the backing is laid up. Prior to parge, all joints on the back of face courses shall be cut flush. Unless otherwise noted, joints shall be not less than 1/4-inch nor more than 1/2-inch wide and whatever width is adopted shall be maintained uniform throughout the work.

d. Pointing. Face joints shall be neatly struck, using the weather joint. All joints shall be finished properly as the laying of the brick progresses. When nails or line pins are used the holes shall be immediately plugged with mortar and pointed when the nail or pin is removed.

e. Cleaning. Upon completion of the work all exterior surfaces shall be thoroughly cleaned by scrubbing and washing down with water and, if necessary to produce satisfactory results, cleaning shall be done with a 5% solution of muriatic acid which shall then be rinsed off with liberal quantities of clean fresh water.

f. Curing and Cold Weather Protection. In hot or dry weather, or when directed by the Engineer, the brick masonry shall be protected and kept moist for at least 48 hours after laying the brick. Brick masonry work or pointing shall not be done when there is frost in the brick or when the air temperature is below 50 F unless the Contractor has on the project ready to use, suitable covering and artificial heating devices necessary to keep the atmosphere surrounding the masonry at a temperature of not less than 60 F for the duration of the curing period.

751-3.3 CONCRETE STRUCTURES. Concrete structures shall be built on prepared foundations, conforming to the dimensions and form indicated on the plans. The construction shall conform to the requirements specified in Item P-610. Any reinforcement required shall be placed as indicated on the plans and shall be approved by the Engineer before the concrete is poured.

All invert channels shall be constructed and shaped accurately so as to be smooth, uniform, and cause minimum resistance to flowing water. The interior bottom shall be sloped downward toward the outlet.

751-3.4 PRECAST CONCRETE PIPE STRUCTURES. Precast concrete pipe structures shall be constructed on prepared or previously placed slab foundations and shall conform to the dimensions and locations shown on the plans. All precast concrete pipe sections necessary to build a completed structure shall be furnished. The different sections shall fit together readily, and all jointing and connections shall be cemented with mortar. The top of the upper precast concrete pipe member shall be suitably formed and dimensioned to receive the metal frame and cover or grate, or other cap, as required. Provision shall be made for any connections for lateral pipe, including drops and leads that may be installed in the structure. The flow lines shall be smooth, uniform, and cause minimum resistance to flow. The metal steps that are embedded or built into the side walls shall be aligned and placed at vertical intervals of 12 inches. When a metal ladder replaces the steps, it shall be securely fastened into position.

751-3.5 INLET AND OUTLET PIPES. Inlet and outlet pipes shall extend through the walls of the structures for a sufficient distance beyond the outside surface to allow for connections but shall be cut off flush with the wall on

the inside surface, unless otherwise directed. For concrete, precast concrete or brick structures, the mortar shall be placed around these pipes so as to form a tight, neat connection.

751-3.6 ADJUSTMENT TO GRADE OF CASTING, FRAMES AND FITTINGS. All existing castings, frames, and covers designated to be adjusted to grade shall be removed prior to pavement laydown. The openings shall be covered with a steel plate during placement of initial lifts of pavement to maximize compaction opportunity of the bituminous pavement. Steel plate shall be sized by the Contractor. Prior to the final lift of pavement, the prior lifts of pavement shall be removed to expose and remove the cover. Concrete rings, brick and mortar shall be used to position the frame to the final elevation. The concrete rings, brick and mortar shall be backfilled with 4,000 psi concrete. The concrete shall match the elevation of the last lift of pavement placed before the final lift.

751-3.7 PIPE HOODS. Pipe Hoods shall be installed on all catch basin outlet pipes as shown on the contract drawings and in accordance with the manufacturer's requirements.

751-3.8 PLACEMENT AND TREATMENT OF CASTINGS, FRAMES, AND FITTINGS. All castings, frames, and fittings shall be placed in the positions indicated on the plans or as directed by the Engineer, and shall be set true to line and to correct elevation. If frames or fittings are to be set in concrete or cement mortar, all anchors or bolts shall be in place and position before the concrete or mortar is placed. The unit shall not be disturbed until the mortar or concrete has set.

All castings, frames and fittings shall be placed immediately prior to placement of the final lift of pavement. The openings shall be covered with a steel plate during placement of initial lifts of pavement to maximize compaction opportunity of the bituminous pavement. Steel plate shall be sized by the Contractor. Prior to the final lift of pavement, the prior lifts of pavement shall be removed to expose and remove the cover. Concrete rings, brick and mortar shall be used to position the frame to the final elevation. The concrete rings, brick and mortar shall be backfilled with 4,000 psi concrete. The concrete shall match the elevation of the last lift of pavement placed before the final lift.

When frames or fittings are to be placed upon previously constructed masonry, the bearing surface or masonry shall be brought true to line and grade and shall present an even bearing surface in order that the entire face or back of the unit will come in contact with the masonry. The unit shall be set in mortar beds and anchored to the masonry as indicated on the plans or as directed and approved by the Engineer. All units shall set firm and secure.

After the frames or fittings have been set in final position and the concrete or mortar has been allowed to harden for 7 days, then the grates or covers shall be placed and fastened down.

751-3.9 INSTALLATION OF STEPS. *Each structure shall have steps.* The steps shall be installed as indicated on the plans or as directed by the Engineer. When the steps are to be set in concrete, they shall be placed and secured in position before the concrete is poured. When the steps are installed in brick masonry, they shall be placed as the masonry is being built. The steps shall not be disturbed or used until the concrete or mortar has hardened for at least 7 days. After this period has elapsed, the steps shall be cleaned and painted, unless they have been galvanized.

With precast concrete pipe structures, they shall be cast into the sides of the pipe at the time the pipe sections are manufactured or set in place after the structure is erected by drilling holes in the concrete and cementing the steps in place.

In lieu of steps, prefabricated ladders may be installed. In the case of brick or concrete structures, the ladder shall be held in place by grouting the supports in drilled holes.

751-3.10 BACKFILLING.

a. After a structure has been completed, the area around it shall be filled with approved material, in horizontal layers not to exceed 8 inches in loose depth, and compacted to the density required in Item P-152. Each layer shall be deposited all around the structure to approximately the same elevation. The top of the fill shall meet the elevation shown on the plans or as directed by the Engineer.

b. Backfilling shall not be placed against any structure until permission is given by the Engineer. In the case of concrete, such permission shall not be given until the concrete has been in place 7 days, or until tests made by the laboratory under supervision of the Engineer establish that the concrete has attained sufficient strength to provide a factor of safety against damage or strain in withstanding any pressure created by the backfill or the methods used in placing it.

c. Backfill shall not be measured for direct payment. Performance of this work shall be considered on obligation of the Contractor covered under the contract unit price for the structure involved.

751-3.11 CLEANING AND RESTORATION OF SITE. After the backfill is completed, the Contractor shall dispose of all surplus material, dirt, and rubbish from the site. Surplus dirt may be deposited in embankments, shoulders, or as ordered by the Engineer. The Contractor shall restore all disturbed areas to their original condition.

After all work is completed, the Contractor shall remove all tools and equipment, leaving the entire site free, clear, and in good condition.

METHOD OF MEASUREMENT

751-4.1 DRAINAGE STRUCTURES. Manholes, catch basins, and inlets shall be measured by the unit (per each).

751-4.2 ADJUST EXISTING STRUCTURES TO GRADE. The quantity of adjusting existing structures to grade shall be measured by the unit (per each).

BASIS OF PAYMENT

751-5.1 The accepted quantities of manholes, catch basins, headwalls and inlets will be paid for at the contract unit price per each in place when completed. This price shall be full compensation for furnishing all materials and for all preparation, excavation, shoring, dewatering, backfilling and placing of the materials; furnishing and installation of such specials and connections to pipes and other structures as may be required to complete the item as shown on the plans; and for all labor equipment, tools and incidentals necessary to complete the structure. Frames, grates/covers, brick, mortar, outlet hoods/down spouts, bedding stone, geotextile, pipe connectors, steps, among other items are all considered incidental to manholes, catch basins, and/or inlets.

751-5.2 The accepted quantities of existing structures to be adjusted to grade will be paid for at the contract unit price per each in place when completed. This price shall be full compensation for furnishing all materials and for all preparation, excavation, backfilling and placing of the materials; and for all labor equipment, tools and incidentals necessary to complete the structure.

Payment will be made under:

Item D-751-1	6-ft. Diameter Manhole	per each
Item D-751-2	4-ft. Diameter Catch Basin	per each
Item D-751-3	6-ft. Diameter Catch Basin	per each
Item D-751-4	Headwall	per each
Item D-751-5	Adjust Existing Structure to Grade	per each
Item D-751-6	8-ft. Diameter Manhole	per each

MATERIAL REQUIREMENT

ASTM A 27	Steel Castings, Carbon, for General Application
ASTM A 47	Ferritic Malleable Iron Castings
ASTM A 48	Gray Iron Castings
ASTM A 123	Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 283	Low and Intermediate Tensile Strength Carbon Steel Plates, Shapes, and Bars
ASTM A 536	Ductile Iron Castings
ASTM A 897	Austempered Ductile Iron Castings
ASTM C 32	Sewer and Manhole Brick (Made from Clay or Shale)
ASTM C 144	Aggregate for Masonry Mortar
ASTM C 150	Portland Cement
ASTM C 478	Precast Reinforced Concrete Manhole Sections

END OF ITEM D-751

ITEM F-162
FENCE AND GATES

CONTRACT DOCUMENTS

162-0.1 This section of these specifications is a part of the Contract Documents as defined in the Contract Articles. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other sections.

Attention shall be directed to the sections of these specifications entitled, "Summary of Work and Special Work Requirements" and "Supplemental Contract Articles".

DESCRIPTION

162-1.1 This item shall consist of furnishing and erecting chain-link fence and gates in accordance with these specifications and the details shown on the plans and in conformity with the lines and grades shown on the plans or established by the Engineer.

MATERIALS

162-2.1 FABRIC. The fabric shall be woven with a 9-gauge galvanized steel wire in a 2 in (50 mm) mesh and shall meet the requirements of ASTM A 392, Class 2. The fabric shall be woven from a 9 gauge aluminum-coated steel wire in a 2 in (50 mm) mesh and shall conform to the requirements of ASTM A 491. Existing fabric removed under ITEM P-152 should be reused as long as it is not damaged or deteriorated.

162-2.2 BARBED WIRE. Barbed wire shall be 2-strand 12-1/2 gauge zinc-coated wire with 4-point barbs and shall conform to the requirements of ASTM A 121, Class 3, Chain Link Fence Grade.

162-2.3 POSTS, RAILS AND BRACES. Line posts, rails, and braces shall conform to the requirements of ASTM F-1043 or ASTM F 1083 as follows.

Galvanized tubular steel pipe shall conform to the requirements of Group IA, (Schedule 40) coatings conforming to Type A, or Group IC (High Strength Pipe), External coating Type B, and internal coating Type B or D.

Roll Formed Steel Shapes (C-Sections) shall conform to the requirements of Group IIA, and be galvanized in accordance with the requirements of F 1043, Type A.

Hot-Rolled Shapes (H Beams) shall meet the requirements of Group III, and be galvanized in accordance with the requirements of F 1043, Type A.

Aluminum Pipe shall conform to the requirements of Group IB.

Aluminum Shapes shall conform to the requirements of Group IIB.

Vinyl or polyester coated steel shall conform to the requirements of ASTM F 1043, Paragraph 7.3 Optional Supplemental Color Coating.

Composite posts shall conform to the strength requirements of ASTM F 1043 or ASTM F 1083. The strength loss of composite posts shall not exceed 10 percent when subjected to 3,600 hours of exposure to light and water in accordance with ASTM G 23, ASTM G 26, and ASTM G-53.

Posts, rails, and braces furnished for use in conjunction with aluminum alloy fabric shall be aluminum alloy or composite.

Posts, rails, and braces, with the exception of galvanized steel conforming to F 1043 or ASTM F 1083, Group 1A, Type A, or aluminum alloy, shall demonstrate the ability to withstand testing in salt spray in accordance with ASTM B 117 as follows:

External: 1,000 hours with a maximum of 5% red rust.

Internal: 650 hours with a maximum of 5% red rust.

The dimensions of the posts, rails, and braces shall be in accordance with Tables I through VI of Fed. Spec. RR-F-191/3. Existing rails and braces removed under ITEM P-152 should be reused as long as they are not damaged or deteriorated.

162-2.4 GATES. Gate frames shall consist of galvanized steel pipe and shall conform to the specifications for the same material under paragraph 162-2.3. The fabric shall be of the same type material as used in the fence. Existing gates removed under ITEM P-152 should be reused as long as they are not damaged or deteriorated.

162-2.5 WIRE TIES AND TENSION WIRES. Wire ties for use in conjunction with a given type of fabric shall be of the same material and coating weight identified with the fabric type. Tension wire shall be 7-gauge marcelled steel wire with the same coating as the fabric type and shall conform to ASTM A 824. All material shall conform to Fed. Spec. RR-F-191/4.

162-2.6 MISCELLANEOUS FITTINGS AND HARDWARE. Miscellaneous steel fittings and hardware for use with **zinc-coated** steel fabric shall be of commercial grade steel or better quality, wrought or cast as appropriate to the article, and sufficient in strength to provide a balanced design when used in conjunction with fabric posts, and wires of the quality specified herein. All steel fittings and hardware shall be protected with a zinc coating applied in conformance with ASTM A 153. Barbed wire support arms shall withstand a load of 250 pounds (113 kg) applied vertically to the outermost end of the arm.

162-2.7 CONCRETE. Concrete shall be of a commercial grade with a minimum 28-day compressive strength of 3000 psi.

162-2.8 MARKING. Each roll of fabric shall carry a tag showing the kind of base metal (steel, aluminum, or aluminum alloy number), kind of coating, the gauge of the wire, the length of fencing in the roll, and the name of the manufacturer. Posts, wire, and other fittings shall be identified as to manufacturer, kind of base metal (steel, aluminum, or aluminum alloy number), and kind of coating.

162-2.9 SIGNS. Existing signs which are mounted to the existing chain link fence shall be relocated to the new fence. Existing signs shall be mounted with new hardware.

Six (6) new “warning” signs shall be provided and installed on the new fence. New signs shall match existing in size, material and message. See drawings for sign details.

CONSTRUCTION METHODS

162-3.1 CLEARING FENCE LINE. All trees, brush, stumps, logs, and other debris which would interfere with the proper construction of the fence in the required location shall be removed a minimum width of 2 ft (61 cm) on each side of the fence centerline before starting fencing operations. The cost of removing and disposing of the material shall not constitute a pay item and shall be considered incidental to fence construction.

162-3.2 INSTALLING POSTS. All corner, end, gate and intermediate posts shall be set in concrete at the required dimension and depth and at the spacing shown on the plans. The posts holes shall be in proper alignment so that there is a minimum of 3 in (75 mm) of concrete on all sides of the posts. Line posts should be spaced not more than 10 ft (3 m) apart and should be driven a minimum of 5 feet into the ground. No concrete is required for line posts.

Were required, concrete shall be thoroughly compacted around the posts by tamping or vibrating and shall have a smooth finish slightly higher than the ground and sloped to drain away from the posts. All posts shall be set plumb

and to the required grade and alignment. No materials shall be installed on the posts, nor shall the posts be disturbed in any manner within 7 days after the individual post footing is completed.

Should rock be encountered at a depth less than the planned footing depth, a hole 2 in (50 mm) larger than the greatest dimension of the posts shall be drilled to a depth of 12 in (300 mm). After the posts are set, the remainder of the drilled hole shall be filled with grout, composed of one part Portland cement and two parts mortar sand. Any remaining space above the rock shall be filled with concrete in the manner described above.

In lieu of drilling, the rock may be excavated to the required footing depth. No extra compensation shall be made for rock excavation.

162-3.3 INSTALLING TOP RAILS. The top rail shall be continuous and shall pass through the post tops. The coupling used to join the top rail lengths shall allow for expansion.

162-3.4 INSTALLING BRACES. Horizontal brace rails, with diagonal truss rods and turnbuckles, shall be installed at all terminal posts.

162-3.5 INSTALLING FABRIC. The wire fabric shall be firmly attached to the posts and braced in the manner shown on the plans. All wire shall be stretched taut and shall be installed to the required elevations. The fence shall generally follow the contour of the ground, with the bottom of the fence fabric no less than 1 in (25 mm) or more than 2 in (50 mm) from the ground surface. Grading shall be performed where necessary to provide a neat appearance.

At locations of small natural swales or drainage ditches and where it is not practical to have the fence conform to the general contour of the ground surface, longer posts may be used and multiple strands of barbed wire stretched thereon to span the opening below the fence. The vertical clearance between strands of barbed wire shall be 6 in (150 mm) or less.

162-3.6 ELECTRICAL GROUNDS. Electrical grounds shall be constructed where a power line passes over the fence and at 500 ft (150 m) intervals. The ground shall be installed directly below the point of crossing. The ground shall be accomplished with a copper clad rod 8 ft (240 cm) long and a minimum of 5/8 in (15 mm) in diameter driven vertically until the top is 6 in (150 mm) below the ground surface. A No. 6 solid copper conductor shall be clamped to the rod and to the fence in such a manner that each element of the fence is grounded. Installation of ground rods shall not constitute a pay item and shall be considered incidental to fence construction.

162-3.7 SIGNS. Methods for attaching the signs (new and existing) to the chain link fence shall be approved by the Engineer. Hardware and other items used to attach the signs shall be stainless steel or aluminum.

Signs shall be installed at locations determined by the Engineer.

METHOD OF MEASUREMENT

162-4.1 Chain-link fence will be measured for payment by the linear foot (meter). Measurement will be along the top of the fence from center to center of end posts, excluding the length occupied by gate openings.

162-4.2 Chain-link vehicle gate will be measured for each gate installed and accepted.

162-4.3 Signs. New and existing signs shall not be measured separately for payment rather they shall be considered incidental to the new fence.

BASIS OF PAYMENT

162-5.1 Payment for **chain-link fence** will be made at the contract unit price per linear foot (meter). The price shall be full compensation for furnishing all materials, and for all preparation, erection, and installation of these materials, and for all labor equipment, tools, and incidentals necessary to complete the item.

162-5.2 Payment for **chain-link vehicle gate** will be made at the contract unit price per each. The price shall be full compensation for furnishing all materials, and for all preparation, erection, and installation of these materials, and for all labor equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item F-162-1	Chain-Link Fence	per Linear Foot
Item F-162-2	Chain-Link Vehicle Gate	per Each

MATERIAL REQUIREMENTS

ASTM A 121	Zinc-Coated (Galvanized) Steel Barbed Wire
ASTM A 123	Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 153	Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 392	Zinc-Coated Steel Chain-Link Fence Fabric
ASTM A 491	Aluminum-Coated Steel Chain-Link Fence Fabric
ASTM A 572	High-Strength Low-Alloy Columbium-Vanadium Steels of Structural Steel Quality
ASTM A 653	Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A 824	Metallic-Coated Steel Marcellled Tension Wire for Use With Chain Link Fence
ASTM A 1011	Steel Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
ASTM B 117	Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM B 221	Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire Shapes and Tubes
ASTM B 429	Aluminum-Alloy Extruded Structural Pipe and Tube
ASTM F 668	Poly(vinyl Chloride)(PVC) and other Organic Polymer-Coated Steel Chain-Link Fence Fabric
ASTM F 1043	Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework
ASTM F 1083	Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures
ASTM F 1183	Aluminum Alloy Chain Link Fence Fabric
ASTM F 1345	Zinc-5% Aluminum-Mischmetal Alloy-Coated Steel Chain Link Fence Fabric
ASTM G 152	Operating Open Flame (Carbon-Arc) Light Apparatus for Exposure of Nonmetallic Materials
ASTM G 153	Operating Enclosed Carbon-Arc Light Apparatus for Exposure of Nonmetallic Materials
ASTM G 154	Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials
ASTM G 155	Operating (Xenon-Arc) Light Apparatus for Exposure of Nonmetallic Materials
FED SPEC RR-F-191/3	Fencing, Wire and Post, Metal (Chain-Link Fence Posts, Top Rails and Braces)
FED SPEC RR-F-191/4	Fencing, Wire and Post, Metal (Chain-Link Fence Accessories)

END OF ITEM F-162

ITEM T-901
SEEDING, PREPARATION OF SEED BEDS, AND MULCH

CONTRACT DOCUMENTS

901-0.1 This section of these specifications is a part of the Contract Documents as defined in the Contract Articles. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other sections.

Attention shall be directed to the sections of these specifications entitled, "Summary of Work and Special Work Requirements" and "Supplemental Contract Articles".

DESCRIPTION

901-1.1 This item shall consist of soil preparation, seeding, and application of mulch at the areas shown on the plans and as directed by the NH Fish and Game Dept. and/or the Engineer in accordance with these specifications.

Conservation Habitat Seed

This specification shall consist of sowing Blue Lupine and Little Blue Stem in conservation areas managed by the New Hampshire Fish and Game Department. The Blue Lupine seed shall be sown simultaneously with the Little Blue Stem seed by a seed drill that has separate bins for the Blue Lupine and Little Blue Stem seed. The Contractor shall be required to provide equipment that is satisfactory to the NHF&G and /or the Engineer. The seed drill settings (rate of application, spacing and similar) shall be submitted for approval not less than 7 calendar days prior to seeding. Conservation Habitat Seed shall be installed in all areas of the project with the exception of areas specifically designated for slope seed.

The NHF&G has directed that no off-site topsoil be applied to parcels to receive Blue Lupine and Little Blue Stem Seed. The Contractor shall clear and grub or strip existing turf/topsoil in accordance with specification P151, place topsoil in accordance with specification T-905, and prepare the seed bed in accordance with this specification prior to the application of the conservation habitat seed.

Slope Seed

Seed used to stabilize the 4:1 slope where the existing drainage ravine is to be filled shall be a mixture of Red Fescue, Kentucky Bluegrass, and Annual Ryegrass and be blanketed as called for on the plans.

MATERIALS

901-2.1 Seed The species and application rates of grass seed furnished shall be those stipulated herein. Seed shall conform to the requirements of Fed. Spec. JJJ-S-181.

Seed shall be furnished separately or in mixtures in standard containers with the seed name, lot number, net weight, percentages of purity and of germination and hard seed, and percentage of maximum weed seed content clearly marked for each kind of seed. The Contractor shall furnish the Engineer duplicate signed copies of a statement by the vendor certifying that each lot of seed has been tested by a recognized laboratory for seed testing within 6 months of date of delivery. This statement shall include: name and address of laboratory, date of test, lot number for each kind of seed, and the results of tests as to name, percentages of purity and of germination, and percentage of weed content for each kind of seed furnished, and, in case of a mixture, the proportions of each kind of seed.

a. Conservation Habitat Seed. Seed mixture shall be as follows:

- | | |
|---------------------|--------------|
| 1) Little Blue Stem | 20 lbs./acre |
| 2) Winter Rye Grain | 30 lbs./acre |

Weed and hard seed shall be 0.00%. Minimum seed purity shall be 85%. Minimum germination shall be 80%.

The weight of **Pure Live Seed** (PLS) is computed by multiplying the labeled purity percent times the labeled germination percent, times the tag weight. All seed shall not have more than zero (0%) percent weed content and be from the same or previous year's crop, unless recent tests from an approved testing agency demonstrate that older seed meets the above requirements.

Lime and fertilizer shall not be allowed in areas to receive conservation habitat seed.

Known contacts specializing in native seeding include:

Known distributors of native plants and seeds include the following:

Earnst Conservation Seeds, Mark Fiely
9006 Mercer Pike
Meadville, Pa 16335
1-(800)-873-3321

Octoraro Wetland, Jim McKensey
Nurseries, Inc.
6126 Street Road
Kirkwood, Pa 17536
(717) 529-3160

Meadowbrook Farm, John Story
1633 Washington Lane
Meadowbrook, Pa 19046
(215) 887-5900

Pinelands Nursery, Don Knesick
323 Island Road
Columbus, NJ 08022
(609) 291-9486

Behn's Best Perennials
689 Albany Turnpike
Old Chatham, NY 12136
(518) 766-9820

Pinelands Nursery, Joan Hansen
261 Pinnacle Road
Gloversville, NY 12078
(518)-725-2095

North Creek Nurseries, Inc., Dale Hendricks,
R.R. #2, Box 33
Landenburg, Pa 19350
(610) 255-0100

Seeding shall be performed during the late summer or fall when the soil temperature is greater than 55°F and when adequate moisture is available to sustain seedling growth. Alternately conservation habitat seeding may occur in late October that would allow the seeding to remain dormant through the winter. If winter rye is grown in advance of the conservation habitat seeding, the Contractor shall mow the grass to an acceptable height to allow seeding. No additional payment shall be made for mowing to perform seeding.

b. Slope Seed (Ravine Fill Slope). Seed mixture shall be as follows:

Seed	Minimum Seed Purity (Percent)	Minimum Germination(Percent)	(PLS) Rate of Application lb./acre
Red Fescue	85% minimum	80% minimum	60
Kentucky Bluegrass	85% minimum	80% minimum	40
Annual Ryegrass	85% minimum	80% minimum	20

The weight of **Pure Live Seed** (PLS) is computed by multiplying the labeled purity percent times the labeled germination percent, times the tag weight. All seed shall not have less than one (1%) percent weed content and be from the same or previous year's crop, unless recent tests from an approved testing agency demonstrate that older seed meets the above requirements.

Slope Seed may include fertilizer and limestone amendments per the requirements of paragraphs 901-2.2 and 901-2.3 as needed to establish a strong stand of grass. Application of lime and fertilizer shall be as recommended by the seed manufacturer for the given site and soil conditions. No separate payment will be made for lime and/or fertilizer.

901-2.2 - Lime. Lime shall be ground limestone containing not less than 85% of total carbonates, and shall be ground to such fineness that 90% will pass through a No. 20 mesh sieve and 50% will pass through a No. 100 mesh sieve. Coarser material will be acceptable, providing the rates of application are increased to provide not less than the minimum quantities and depth specified in the special provisions on the basis of the two sieve requirements above. Dolomitic lime or a high magnesium lime shall contain at least 10% of magnesium oxide.

All liming materials shall conform to the requirements of ASTM C 602.

Lime shall not be applied to areas to receive conservation habitat seed.

901-2.3 - Fertilizer. Fertilizer shall be standard commercial fertilizers supplied separately or in mixtures containing the percentages of total nitrogen, available phosphoric acid, and water-soluble potash. They shall be applied at the rate and to the depth recommended by the seed manufacturer, and shall meet the requirements of Fed. Spec. O-F-241 and applicable state laws. They shall be furnished in standard containers with name, weight, and guaranteed analysis of contents clearly marked thereon. No cyanamide compounds or hydrated lime shall be permitted in mixed fertilizers.

The fertilizers may be supplied in one of the following forms:

- a. A dry, free-flowing fertilizer suitable for application by a common fertilizer spreader;
- b. A finely-ground fertilizer soluble in water, suitable for application by power sprayers; or
- c. A granular or pellet form suitable for application by blower equipment.

Fertilizer shall not be applied to areas to receive conservation habitat seed.

901-2.4 Soil for Repairs. The soil for fill and topsoiling of areas to be repaired shall be at least of equal quality to that which exists in areas adjacent to the area to be repaired. The soil shall be relatively free from large stones, roots, stumps, or other materials that will interfere with subsequent sowing of seed, compacting, and establishing turf, and shall be approved by the Engineer before being placed.

901-2.5 Mulch. Mulch to be used for establishment of conservation habitat seed and erosion control shall be wood fiber mulch. Mulch shall consist of product(s) commercially available for use in spray (wet) application methods.

Wood fiber for mulching shall be a first generation product manufactured directly from 100 percent wood which has been recovered or diverted from solid waste. Wood fiber shall be manufactured from unadulterated wood that is not contaminated with paint, chemicals, shingles, plastic or other foreign materials. Wood fiber mulch shall not be manufactured from or include paper. Wood fiber mulch shall be manufactured so that the wood fibers will remain uniformly suspended in water under agitation and will blend with other additives to form a homogeneous slurry. It shall have the characteristics which, upon hydraulic application, shall form a blotter-like ground coating with moisture absorption and percolation properties and the ability to cover and hold seeds in contact with the soil. Wood fiber mulch shall contain no growth or germination inhibiting factors, and shall contain a nonpermanent green dye. Wood fiber mulch shall be supplied in the manufacturer's standard containers, with the name of the material, net weight of contents, the manufacturer's name and the air dry weight of fiber (equivalent to 10% moisture) appearing on each container.

CONSTRUCTION METHODS

901-3.1 Advance Preparation. After clearing and grubbing of areas or removal of the existing topsoil, the areas shall be graded per the contract drawings and topsoil placed. Areas to be seeded shall be raked or otherwise cleared

of grasses, roots, brush and stones larger than 2 inches (50 mm) in any diameter, sticks, stumps, and other debris which might interfere with sowing of seed, growth of grasses, or subsequent maintenance of grass-covered areas. If any damage by erosion or other causes has occurred after the completion of grading and before beginning the application of seed, the Contractor shall repair such damage. This may include filling gullies, smoothing irregularities, and repairing other incidental damage.

Specific site preparation requirements will depend on the condition of the planting areas prior to seeding and the method of seeding conducted by the Contractor. An area to be seeded shall be considered a satisfactory seedbed by the Engineer without additional treatment if it has the required minimum depth of topsoil, has recently been thoroughly loosened and worked to a depth of not less than 4 inches as a result of grading operations and, if immediately prior to seeding, the top 3 inches of soil is loose, friable, reasonably free from large clods, rocks, large roots, or other undesirable matter, and if shaped to the required grade.

However, when the area to be seeded is sparsely sodded, weedy, barren and unworked, or packed and hard, any grass and weeds shall first be cut or otherwise satisfactorily disposed of. The soil shall then be scarified or otherwise loosened to a depth not less than 3 inches (125 mm). Clods shall be broken and the top 3 inches (75 mm) of soil shall be worked into a satisfactory seedbed by discing, or by use of cultipackers, rollers, drags, harrows, or other appropriate means.

The Contractor shall obtain the Engineer's approval of satisfactory seed bed prior to seeding.

901-3.2 Seed Drilling. For the conservation habitat seed mix, seed drilling is required. Seeds shall be sown at a constant depth of 1/4" unless otherwise recommended by the seed distributor and be well covered.

901-3.3 Dry Application Method.

- a. **Liming.** When directed and approved by the seed manufacturer, lime shall be applied separately and prior to the application of any fertilizer or seed and only on seedbeds which have previously been prepared as described above. The lime shall then be worked into the top 3 inches (75 mm) of soil after which the seedbed shall again be properly graded and dressed to a smooth finish.
- b. **Fertilizing.** When directed and approved by the seed manufacturer fertilizer shall be uniformly spread at the recommended rate.
- c. **Seeding.** Grass seed shall be sown at the rate specified in paragraph 901-2.1. Seeds of legumes, either alone or in mixtures, shall be inoculated before mixing or sowing, in accordance with the instructions of the manufacturer of the inoculant. When seeding is required at other than the seasons shown on the plans or in the special provisions, a cover crop shall be sown by the same methods required for grass and legume seeding.
- d. **Rolling.** After the seed has been properly covered, the seedbed shall be immediately compacted by means of an approved lawnroller, weighing 40 to 65 pounds per foot (60 to 97 kg per meter) of width for clay soil (or any soil having a tendency to pack), and weighing 150 to 200 pounds per foot (223 to 298 kg per meter) of width for sandy or light soils.

901-3.4 Wet Application Method.

- a. **General.** When allowed, the Contractor may elect to apply seed (and lime, if required) by spraying them on the previously prepared seedbed in the form of an aqueous mixture and by using the methods and equipment described herein. The rates of application shall be as specified in paragraph 901-2.1.
- b. **Spraying Equipment.** The spraying equipment shall have a container or water tank equipped with a liquid level gauge calibrated to read in increments not larger than 50 gallons (190 liters) over the entire range of the tank capacity, mounted so as to be visible to the nozzle operator. The container or tank shall also be

equipped with a mechanical power-driven agitator capable of keeping all the solids in the mixture in complete suspension at all times until used.

The unit shall also be equipped with a pressure pump capable of delivering 100 gallons (380 liters) per minute at a pressure of 100 pounds per square inch (690 kPa). The pump shall be mounted in a line which will recirculate the mixture through the tank whenever it is not being sprayed from the nozzle. All pump passages and pipe lines shall be capable of providing clearance for 5/8 inch (15 mm) solids. The power unit for the pump and agitator shall have controls mounted so as to be accessible to the nozzle operator. There shall be an indicating pressure gauge connected and mounted immediately at the back of the nozzle.

The nozzle pipe shall be mounted on an elevated supporting stand in such a manner that it can be rotated through 360 degrees horizontally and inclined vertically from at least 20 degrees below to at least 60 degrees above the horizontal. There shall be a quick-acting, three-way control valve connecting the recirculating line to the nozzle pipe and mounted so that the nozzle operator can control and regulate the amount of flow of mixture delivered to the nozzle. At least three different types of nozzles shall be supplied so that mixtures may be properly sprayed over distance varying from 20 to 100 feet (6 to 30 m). One shall be a close-range ribbon nozzle, one a medium-range ribbon nozzle, and one a long-range jet nozzle. For ease of removal and cleaning, all nozzles shall be connected to the nozzle pipe by means of quick-release couplings.

In order to reach areas inaccessible to the regular equipment, an extension hose at least 50 feet (15 m) in length shall be provided to which the nozzles may be connected.

- c. **Mixtures.** Seed and carrier material shall be mixed together such that not more than a total of 220 pounds (100 kg) of these combined solids shall be added to and mixed with each 100 gallons (380 liters) of water.

All water used shall be obtained from fresh water sources and shall be free from injurious chemicals and other toxic substances harmful to plant life. Brackish water shall not be used at any time. The Contractor shall identify to the Engineer all sources of water at least 2 weeks prior to use. The Engineer may take samples of the water at the source or from the tank at any time and have a laboratory test the samples for chemical and saline content. The Contractor shall not use any water from any source which is disapproved by the Engineer following such tests.

All mixtures shall be constantly agitated from the time they are mixed until they are finally applied to the seedbed. All such mixtures shall be used within 2 hours from the time they were mixed or they shall be wasted and disposed of at locations acceptable to the Engineer.

- d. **Spraying.** Mixtures of seed and carrier material (not fertilizer) shall only be sprayed upon previously prepared seedbeds on which the lime, if required, shall already have been worked in. The mixtures shall be applied by means of a high-pressure spray which shall always be directed upward into the air so that the mixtures will fall to the ground like rain in a uniform spray. Nozzles or sprays shall never be directed toward the ground in such a manner as might produce erosion or runoff.

Particular care shall be exercised to insure that the application is made uniformly and at the prescribed rate and to guard against misses and overlapped areas. Proper predetermined quantities of the mixture in accordance with specifications shall be used to cover specified sections of known area. Checks on the rate and uniformity of application may be made by observing the degree of wetting of the ground or by distributing test sheets of paper or pans over the area at intervals and observing the quantity of material deposited thereon.

On surfaces which are to be mulched as indicated by the plans or designated by the Engineer, seed applied by the spray method need not be raked into the soil or rolled. However, on surfaces on which mulch is not to be used, the raking and rolling operations will be required after the soil has dried.

901-3.5 Maintenance and Establishment of Seeded Areas. The Contractor shall protect seeded areas against traffic or other use by warning signs or barricades, as approved by the Engineer. Surfaces gullied or otherwise

damaged following seeding shall be repaired by regrading and reseeding as directed. The Contractor shall mow, water, and otherwise maintain seeded areas in a satisfactory condition until final inspection and acceptance of the work. Water shall be provided by the Contractor.

When either the no-till, dry or wet application method outlined above is used for work done out of season, it will be required that the Contractor establish a good stand of grass of uniform color and density to the satisfaction of the Engineer. Bare spots shall not be more than one square foot, randomly dispersed, and not exceed 3% of the seeded area. If at the time when the contract has been otherwise completed it is not possible to make an adequate determination of the color, density, and uniformity of such stand of grass, payment for the unaccepted portions of the areas seeded out of season will be withheld until such time as these requirements have been met.

901-3.6 Special Project Warranty. Warranty seeded materials for a period of one year after date of substantial completion of the planting, against defects, including death and unsatisfactory growth, but excepting defects resulting from neglect by Owner, abuse or damage by others, or phenomena beyond Contractor's control.

901-3.7 Timing of work. The contractor shall consider the manufacturer's growing season recommendation for the method of installation and type of seed(s) to be used. The Contractor shall maintain all seed beds until proper growth is established and accepted by the Engineer. All areas shall be stabilized (seeded) immediately after final grading and placement of topsoil to prevent erosion. Areas that do not allow adequate time for the specified seed to germinate and establish a strong stand of grass before winter shall be protected from erosion in accordance with the NHDES erosion control methods until such time that the specified seed is established. If temporary seed is applied for winter stabilization, it shall be Winter Rye. If winter rye is grown in advance of the conservation habitat seeding, the Contractor shall mow the grass to an acceptable height to allow final seeding. No additional payment shall be made for mowing to perform seeding. No separate payment for winter stabilization (seed and/or mulch) to protect the disturbed areas shall be made.

METHOD OF MEASUREMENT

901-4.1 The quantity of Seeding and Establishment to be paid for shall be the number of square yards measured on the ground surface, completed and accepted.

901-4.2 The quantity of mulch to be paid for shall be the number of square yards measured on the ground surface, completed and accepted.

BASIS OF PAYMENT

901-5.1 Payment for Seeding and Establishment shall be made at the contract unit price per square yard or fraction thereof, which price and payment shall be full compensation for furnishing and placing all material and for all labor, equipment, tools, and incidentals necessary to complete the work prescribed in this item.

901-5.2 Payment for mulch shall be made at the contract unit price per square yard or fraction thereof, which price and payment shall be full compensation for furnishing and placing all material and for all labor, equipment, tools, and incidentals necessary to complete the work prescribed in this item.

Payment will be made under:

Item T901-1	Conservation Habitat Seed	per Square Yard
Item T901-2	Slope Seed	per Square Yard
Item T901-3	Wood Fiber Mulch	per Square Yard

MATERIAL REQUIREMENTS

Fed. Spec. JJJ-S-181B Agricultural Seeds

END OF ITEM T-901

ITEM T-905
TOPSOIL

CONTRACT DOCUMENTS

905-0.1 This section of these specifications is a part of the Contract Documents as defined in the Contract Articles. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other sections.

Attention shall be directed to the sections of these specifications entitled, "Summary of Work and Special Work Requirements" and "Supplemental Contract Articles".

DESCRIPTION

905-1.1 This item shall consist of preparing the ground surface for topsoil application, removing and transporting topsoil from designated stockpiles or areas to be stripped on the site, and placing and spreading the topsoil on prepared areas in accordance with this specification at the locations shown on the plans or as directed by the Engineer.

MATERIALS

905-2.1 Topsoil. Topsoil shall be the surface layer of soil with no admixture of refuse or any material toxic to plant growth, and it shall be reasonably free from subsoil and stumps, roots, brush, stones (2 inches or more in diameter), clay lumps or similar objects. Brush and other vegetation which will not be incorporated with the soil during handling operations shall be cut and removed. **All topsoil shall be screened prior to final placement.** Ordinary sods and herbaceous growth such as existing lupine and sweet tea are not to be removed but shall be thoroughly broken up and intermixed with the soil during handling operations. In areas to receive conservation habitat seed, as specified in 901-2.1, existing topsoil shall not be amended in any way.

The topsoil for the ravine fill slope, shall have a pH range of approximately 5.5 pH to 7.6 pH, when tested in accordance with the methods of testing of the association of official agricultural chemists in effect on the date of invitation of bids. The organic content shall be not less than 3% nor more than 20% as determined by the wet-combustion method (chromic acid reduction). There shall be not less than 20% nor more than 80% of the material passing the 200 mesh (0.075 mm) sieve as determined by the wash test in accordance with ASTM C 117.

905-2.2 Offsite Materials. Imported or off-site topsoil material shall not be used in areas to receive conservation habitat seed. Offsite topsoil may be used on the 4:1 ravine fill slope at the contractor's discretion. Such offsite topsoil shall be paid for as "topsoil".

CONSTRUCTION METHODS

905-3.1 General. The contractor shall excavate the existing topsoil material within the limit of work, screen the material at the on-site screening plant (contractor provided) and replace the screened material within the designated work areas. All excess material and unsuitable material as a result of the screening operation shall become the property of the contractor and legally disposed of off airport property at no additional cost.

Suitable equipment necessary for proper preparation and treatment of the ground surface, stripping of topsoil, pulverizing, and for the handling and placing of all required materials shall be on hand, in good condition, and approved by the Engineer before the various operations are started.

905-3.2 Preparing The Ground Surface. Immediately prior to dumping and spreading the topsoil on any area, the surface shall be loosened by discs or spike-tooth harrows, or by other means approved by the Engineer, to a minimum depth of 2 inches (50 mm) to facilitate bonding of the topsoil to the covered subgrade soil. The surface of the area to be topsoiled shall be cleared of all stones larger than 2 inches (50 mm) in any diameter and all litter or other material which may be detrimental to proper bonding, the rise of capillary moisture, or the proper growth of the desired planting. Limited areas, as shown on the plans, which are too compact to respond to these operations shall receive special scarification.

Grades on the area to be topsoiled, which have been established by others as shown on the plans, shall be maintained in a true and even condition. Where grades have not been established, the areas shall be smooth-graded and the surface left at the prescribed grades in an even and properly compacted condition to prevent, insofar as practical, the formation of low places or pockets where water will stand.

905-3.3 Obtaining Topsoil. Prior to the stripping of topsoil from designated areas, briars, stumps and large roots, woody vegetation, rubbish or stones found on such areas, which may interfere with subsequent operations, shall be removed using methods approved by the Engineer. Existing vegetation consisting of lupine, sweet tea, and other non-woody vegetation is not to be removed but shall be thoroughly broken up and intermixed with the soil during handling operations. Disking, tilling, or pulverizing of the existing turf prior to striping of the topsoil is at the contractor's discretion. The contractor shall ensure there is sufficient onsite material to be used for topsoil prior to using any existing topsoil in the formation of embankments.

The Contractor shall remove the exiting topsoil from within the limits of disturbance of the designated work areas and to the depth as directed by the Engineer. The topsoil shall be spread on areas already tilled and smooth-graded, or stockpiled in areas approved by the Engineer. Any topsoil stockpiled by the Contractor shall be re-handled and placed without additional compensation. Any topsoil that has been stockpiled on the site by others, and is required for topsoiling purposes, shall be removed and placed by the Contractor. The sites of all stockpiles and areas adjacent thereto which have been disturbed by the Contractor shall be graded if required and put into a condition acceptable for seeding.

When suitable topsoil is secured off the airport site, the Contractor shall locate and obtain the supply, subject to the approval of the Engineer. **All topsoil shall be screened prior to final placement.** The Contractor shall notify the Engineer sufficiently in advance of operations in order that necessary measurements and tests can be made. The Contractor shall remove the topsoil from approved areas and to the depth as directed. The topsoil shall be hauled to the site of the work and placed for spreading, or spread as required. Any topsoil hauled to the site of the work and stockpiled shall be re-handled and placed without additional compensation.

905-3.4 Placing Topsoil. The topsoil shall be evenly spread on the prepared areas to a uniform depth of 4 inches (50 mm) after compaction, unless otherwise shown on the plans or stated in the special provisions. Spreading shall not be done when the ground or topsoil is frozen, excessively wet, or otherwise in a condition detrimental to the work. Spreading shall be carried on so that turfing operations can proceed with a minimum of soil preparation or tilling.

After spreading, any large, stiff clods and hard lumps shall be broken with a pulverizer or by other effective means, and all stones or rocks (2 inches (50 mm) or more in diameter), roots, litter, or any foreign matter shall be raked up and disposed of by the Contractor. After spreading is completed, the topsoil shall be satisfactorily compacted by rolling with a cultipacker or by other means approved by the Engineer. The compacted topsoil surface shall conform to the required lines, grades, and cross sections. Any topsoil or other dirt falling upon pavements as a result of hauling or handling of topsoil shall be promptly removed.

METHOD OF MEASUREMENT

905-4.1 The quantity of topsoil shall be measured by the square yard.

BASIS OF PAYMENT

905-5.1 Payment for topsoil will be made at the contract unit price per square yard. The price shall be full compensation for furnishing all materials and installation of these materials, and for all labor equipment, tools, and incidentals necessary to complete the item. There shall be no separate payment for stockpiling, transporting, or rehandling. On-site and off-site topsoil shall be paid as "topsoil".

Payment will be made under:

Item T-905-1	Topsoil	per Square Yard
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END OF ITEM T-905

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ITEM L-107
AIRPORT WIND CONE

CONTRACT DOCUMENTS

107-0.1 This section of these specifications is a part of the Contract Documents as defined in the General Conditions. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other sections.

Attention shall be directed to the sections of these specifications entitled, "Summary of Work and Special Work Requirements" and "Supplemental Contract Articles".

DESCRIPTION

107-1.1 This item shall consist of furnishing and installing an internally lighted airport wind cone, pole, lights and electrical in accordance with these specifications and in accordance with the dimensions, design, and details shown in the plans.

The work shall include the furnishing and installation of a support for mounting the wind cone, the specified wire, and a concrete foundation. The item shall also include all cable connections, junction can, conduit and conduit fittings, the furnishing and installation of all lamps, ground rod and ground connection, the testing of the installation, and all incidentals necessary to place the wind cone in operation as a completed unit to the satisfaction of the Engineer.

EQUIPMENT AND MATERIALS

107-2.1 GENERAL.

a. Airport lighting equipment and materials covered by Federal Aviation Administration (FAA) specifications shall be certified and listed under Advisory Circular (AC) 150/5345-53, Airport Lighting Equipment Certification Program.

b. All other equipment and materials covered by other referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when requested by the Engineer.

c. Manufacturer's certifications shall not relieve the Contractor of the Contractor's responsibility to provide materials in accordance with these specifications and acceptable to the Engineer. Materials supplied and/or installed that do not materially comply with these specifications shall be removed, when directed by the Engineer and replaced with materials, which do comply with these specifications, at the sole cost of the Contractor.

d. All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify pertinent products or models applicable to this project. Indicate all optional equipment and delete non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment for which they apply on each submittal sheet. Markings shall be boldly and clearly made with arrows or circles (highlighting is not acceptable). Contractor is solely responsible for delays in project accruing directly or indirectly from late submissions or resubmissions of submittals.

e. The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications. The Contractor's submittals shall be neatly bound in a properly sized 3-ring binder, tabbed by specification section. The Engineer reserves the right to reject any and all

equipment, materials or procedures, which, in the Engineer's opinion, does not meet the system design and the standards and codes, specified herein.

f. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

107-2.2 WIND CONES. The 8-foot wind cone and assemblies shall conform to the requirements of AC 150/5345-27, Specification for Wind Cone Assemblies.

107-2.3 WIRE. Wire in conduit rated up to 5,000 volts shall conform to AC 150/5345-7, Specification for L-824 Underground Cable for Airport Lighting Circuits for Rubber Insulated Neoprene Covered Wire, or Fed. Spec. J-C-30, Type RHW, for rubber insulated fibrous covered wire. For ratings up to 600 volts, thermoplastic wire conforming to Fed. Spec. J-C-30, Types TW, THW, and THWN, shall be used. The wires shall be of the type, size, number of conductors, and voltage shown in the plans or in the proposal.

107-2.4 CONDUIT. Rigid steel conduit and fittings shall conform to the requirements of Underwriters Laboratories Standard 6, 514, and 1242.

107-2.5 PLASTIC CONDUIT (for use below grade only). Plastic conduit and fittings shall conform to the requirements of Fed. Spec. W--C-1094 and Underwriters Laboratories Standards UL-651 and shall be one of the following, as shown in the plans:

a. Type I--Schedule 40 PVC suitable for underground use either direct-buried or encased in concrete.

b. Type II--Schedule 40 PVC suitable for either above ground or underground use.

Plastic conduit adhesive shall be a solvent cement manufactured specifically for the purpose of gluing the specific type of plastic conduit and fitting.

107-2.6 CONCRETE. The concrete for foundations shall be proportioned, placed, and cured in accordance with Item P-610, Structural Portland Cement Concrete.

107-2.7 PAINT.

a. Priming paint for ungalvanized metal surfaces shall be a high solids alkyd primer conforming to TT-P-664D.

b. Priming paint for galvanized metal surfaces shall be zinc dust-zinc oxide primer paint conforming to MIL-DTL-24441/19B. If necessary, add not more than ½ pint (0.06 liter) of turpentine to each gallon (liter).

c. Orange paint for the body and the finish coats on metal and wood surfaces shall consist of a ready-mixed non-fading paint meeting the requirements of Fed. Spec. TT-E-489. The color shall be in accordance with Federal Standards 595, Aviation Gloss Orange Number 12197.

d. White paint for body and finish coats on metal and wood surfaces shall be ready-mixed paint conforming to the Master Painter's Institute, Reference #9, Exterior Alkyd, Gloss, VOC Range E2.

e. Priming paint for wood surfaces shall be mixed on the job by thinning the above specified aviation-orange or white paint by adding ½ pint (0.06 liter) of raw linseed oil to each gallon (liter).

107-2.8 JUNCTION CAN. Junction cans shall be L-867 12-inch diameter, Class I, Size B light base with stainless steel cover, rubber gasket, stainless steel bolts, and ground clamp. Provide drain in bottom of the can.

CONSTRUCTION METHODS

107-3.1 INSTALLATION. The hinged support or hinged pole shall be installed on a concrete foundation as shown in the plans.

107-3.2 POLE ERECTION. The Contractor shall erect the pole on the foundation following the manufacturer's requirements and erection details. The pole shall be level and secure.

107-3.3 ELECTRICAL CONNECTION. The Contractor shall furnish all labor and materials and shall make complete electrical connections in accordance with the wiring diagram furnished with the project plans. The electrical installation shall conform to the requirements of the latest edition of National Fire Protection Association, NFPA-70, National Electric Code.

If underground cable from the transformer vault to the wind cone site and duct for this cable installation is required, the cable and duct shall be installed in accordance with and paid for as described in Item L-108, Underground Power Cables for Airports, and Item L-110, Airport Underground Electrical Duct Banks and Conduits.

107-3.4 GROUND CONNECTION AND GROUND ROD. The Contractor shall furnish and install a ground rod, grounding cable, and ground clamps for grounding the "A" frame of the 12-foot (3.5 m) assembly or pipe support of the 8-foot (240 cm) support near the base. The ground rod shall be of the type, diameter and length specified in Item L-108, Underground Power Cable for Airports. The ground rod shall be driven into the ground adjacent to the concrete foundation (minimum distance from foundation of 2 feet) so that the top is at least 6 inches (150 mm) below grade. The grounding cable shall consist of No. 4 AWG minima bare stranded copper wire or larger and shall be firmly attached to the ground rod by exothermic welding. The other end of the grounding cable shall be securely attached to a leg of the frame or to the base of the pipe support with non-corrosive metal and shall be of substantial construction. The resistance to ground shall not exceed 25 ohms.

107-3.5 PAINTING. Three coats of paint shall be applied (one prime, one body, and one finish) to all exposed material installed under this item except the fabric cone, obstruction light globe, and lamp reflectors. The wind cone assembly, if painted on receipt, shall be given one finish coat of paint in lieu of the three coats specified above. The paint shall meet the requirements of Fed. Spec. TT-E-489. The color shall be in accordance with Federal Standard 595, Aviation Gloss Orange Number 12197.

107-3.6 LAMPS. The Contractor shall furnish and install lamps as specified by the manufacturer.

107-3.7 CHAIN AND PADLOCK. The Contractor shall furnish and install a suitable operating chain for lowering and raising the hinged top section. The chain shall be attached to the pole support in a manner to prevent the light fixture assembly from striking the ground in the lowered position.

A padlock shall also be furnished by the Contractor on the 8-foot (240 cm) wind cone for securing the hinged top section to the fixed lower section. Keys for the padlock shall be delivered to the Engineer.

METHOD OF MEASUREMENT

107-4.1 The quantity to be paid for shall be the number of wind cones installed as completed units in place, accepted, and ready for operation. This shall include the internally lighted wind sock, pole, foundation, cable, ground rod, conduit, L-867 can, isolation transformer, and disconnect switch.

Cable and conduit upstream of L-867 junction shall not be included in this pay item.

BASIS OF PAYMENT

107-5.1 Payment will be made at the contract unit price for each completed and accepted job. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Payment will be made under:

L-107-1	8-Foot Wind Cone, in place	per Each
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MATERIAL REQUIREMENTS

AC 150/5345-7	Specification for L-824 Underground Cable for Airport Lighting Circuits
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AC 150/5345-27	Specification for Wind Cone Assemblies
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FED SPEC TT-E-489	Enamel, Alkyd, Gloss, Low VOC Content
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FED SPEC J-C-30	Cable and Wire, Electrical (Power, Fixed Installation) (cancelled; replaced by AA-59544 Cable and Wire, Electrical (Power, Fixed Installation))
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FED SPEC W-P-115	Panel, Power Distribution
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FED STD 595	Colors Used in Government Procurement
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MIL-DTL-24441/20	Paint, Epoxy-Polyamide, Green Primer, Formula 150, Type III
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Underwriters Laboratories Standard 6	Rigid Metal Conduit
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Underwriters Laboratories Standard 514	Fittings For Conduit and Outlet Boxes
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Underwriters Laboratories Standard 1242	Intermediate Metal Conduit
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NFPA-70	National Electric Code
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Master Painter's Institute

END OF ITEM L-107

ITEM L-108
UNDERGROUND POWER CABLE FOR AIRPORTS

CONTRACT DOCUMENTS

108-0.1 This section of these specifications is a part of the Contract Documents as defined in the Contract Articles. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other sections.

Attention shall be directed to the sections of these specifications entitled, "Summary of Work and Special Work Requirements" and "Supplemental Contract Articles".

DESCRIPTION

108-1.1 This item shall consist of furnishing and installing power cables direct buried and furnishing and/or installing power cables within conduit or duct banks in accordance with these specifications at the locations shown on the plans. Also included are the installation of counterpoise wires, ground wires, ground rods and connections, cable splicing, cable marking, cable testing, and all incidentals necessary to place the cable in operating condition as a completed unit to the satisfaction of the Engineer. This item shall not include the installation of duct banks or conduit, trenching and backfilling for duct banks or conduit, or furnishing or installation of any cable for FAA facilities. Requirements and payment for trenching and backfilling for the installation of underground conduit and duct banks is covered under Item L-110 "Airport Underground Electrical Duct Banks and Conduits."

Attention shall be directed to the sections of these specifications entitled, "Summary of Work and Special Work Requirements" and "Supplemental Contract Articles".

EQUIPMENT AND MATERIALS

108-2.1 GENERAL.

a. Airport lighting equipment and materials covered by Federal Aviation Administration (FAA) specifications shall be approved under the Airport Lighting Equipment Certification Program described in Advisory Circular (AC) 150/5345-53, current version.

b. All other equipment and materials covered by other referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification, when requested by the Engineer.

c. Manufacturer's certifications shall not relieve the Contractor of the Contractor's responsibility to provide materials in accordance with these specifications and acceptable to the Engineer. Materials supplied and/or installed that do not materially comply with these specifications shall be removed, when directed by the Engineer and replaced with materials, which do comply with these specifications, at the sole cost of the Contractor.

d. All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify pertinent products or models applicable to this project. Indicate all optional equipment and delete non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment for which they apply on each submittal sheet. Markings shall be boldly and clearly made with arrows or circles (highlighting is not acceptable). Contractor is solely responsible for delays in project accruing directly or indirectly from late submissions or resubmissions of submittals.

e. The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications. The Contractor's submittals shall be neatly bound in a properly sized 3-ring binder, tabbed by specification section. The Engineer reserves the right to reject any and all equipment, materials or procedures, which, in the Engineer's opinion, does not meet the system design and the standards and codes, specified herein.

f. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner. The Contractor shall be responsible to maintain an insulation resistance of 50 megohms minima, (1000 V megger) with isolation transformers connected in new circuits and new segments of existing circuits through the end of the contract warranty period.

108-2.2 CABLE. Underground cable for airfield lighting facilities (runway and taxiway lights and signs) shall conform to the requirements of AC 150/5345-7, Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits. Conductor sizes noted above shall not apply to leads furnished by manufacturers on airfield lighting transformers and fixtures.

Wire for electrical circuits up to 600 volts shall comply with Specification L-824 and/or Federal Specification J-C-30 and shall be type THWN-2.

Cable type, size, number of conductors, strand and service voltage shall be as specified on the plans.

108-2.3 BARE COPPER WIRE (COUNTERPOISE, BARE COPPER WIRE GROUND AND GROUND RODS). Wire for counterpoise or ground installations for airfield lighting systems shall be No. 6 AWG solid for counterpoise and or No. 6 AWG stranded for ground wire conforming to ASTM B 3 and ASTM B 8, and shall be **bare copper wire** conforming to the requirements of ASTM D 33.

Ground rods shall be **copper**. The ground rods shall be of the length and diameter specified on the plans, but in no case shall they be less than 8-feet (240 cm) long nor less than 5/8 in (15 mm) in diameter.

108-2.4 CABLE CONNECTIONS. In-line connections of underground primary cables shall be of the type called for on the plans, and shall be one of the types listed below. No separate payment will be made for cable connections.

a. **The Field-attached Plug-in Splice.** Figure 3 of AC 150/5345-26, Specification for L-823 Plug and Receptacle, Cable Connectors, employing connector kits, is acceptable for field attachment to single conductor cable. It shall be the Contractor's responsibility to determine the outside diameter of the cable to be spliced and to furnish appropriately sized connector kits and/or adapters and heat shrink tubing with integral sealant.

All connections of counterpoise, grounding conductors and ground rods shall be made by the exothermic process or approved equivalent, except the base can ground clamp connector shall be used for attachment to the base can. All exothermic connections shall be made in accordance with the manufacturer's recommendations and listings.

108-2.5 SPLICER QUALIFICATIONS. Every airfield lighting cable splicer shall be qualified in making cable splices and terminations on cables rated above 5,000 volts AC. The Contractor shall submit to the Engineer proof of the qualifications of each proposed cable splicer for the cable type and voltage level to be worked on. Cable splicing/terminating personnel shall have a minimum of three (3) years continuous experience in terminating/splicing medium voltage cable.

108-2.6 CONCRETE. Concrete for cable markers shall conform to Specification Item P-610, "Structural Portland Cement Concrete."

108-2.7 CABLE IDENTIFICATION TAGS. Cable identification tags shall be made from a non-corrosive material with the circuit identification stamped or etched onto the tag. The tags shall be of the type as detailed on the plans.

108-2.8 TAPE. Electrical tapes shall be Scotch Electrical Tapes – number Scotch 88 (1-1/2" wide) and Scotch 130C linerless rubber splicing tape (2" wide), as manufactured by the Minnesota Mining and Manufacturing Company, or approved equivalent.

108-2.9 ELECTRICAL COATING. Scotchkote™ shall be as manufactured by Minnesota Mining and Manufacturing Company, or approved equivalent.

108-2.10 EXISTING CIRCUITS. Whenever the scope of work requires, connection to an existing circuit, the circuit's insulation resistance shall be tested, in the presence of the Engineer. The test shall be performed in accordance with this item and prior to any activity affecting the respective circuit. The Contractor shall record the results on forms acceptable to the engineer. When the work affecting the circuit is complete, the circuit's insulation resistance shall be checked again, in the presence of the Engineer. The Contractor shall record the results on forms acceptable to the engineer. The second reading shall be equal to or greater than the first reading or the Contractor shall make the necessary repairs to the circuit to bring the second reading above the first reading. All repair costs

including a complete replacement of the L-823 connectors, L-830 transformers and L-824 cable, if necessary, shall be borne by the Contractor. All test results shall be submitted in the Operation and Maintenance (O&M) Manual.

CONSTRUCTION METHODS

108-3.1 GENERAL. The Contractor shall install the specified cable at the approximate locations indicated on the plans. Unless otherwise shown on the plans, all cable required to cross under pavements expected to carry aircraft loads shall be installed in concrete encased duct banks. Wherever possible, cable shall be run without splices, from connection to connection.

Cable connections between lights will be permitted only at the light locations for connecting the underground cable to the primary leads of the individual isolation transformers. The Contractor shall be responsible for providing cable in continuous lengths for home runs or other long cable runs without connections, unless otherwise authorized in writing by the Engineer or shown on the plans.

Provide not less than 3 feet of cable slack on each side of all connections, isolation transformers, light units, and at points where cable is connected to field equipment. Where provisions must be made for testing or for future above grade connections, provide enough slack to allow the cable to be extended at least 1 ft vertically above the top of the access structure. This requirement also applies where primary cable passes through empty base cans, junction and access structures to allow for future connections, or as designated by the Engineer.

108-3.2 INSTALLATION IN DUCT BANKS OR CONDUITS. This item includes the installation of the cable in duct banks or conduit as described below. The maximum number and voltage ratings of cables installed in each single duct or conduit, and the current-carrying capacity of each cable shall be in accordance with the latest National Electric Code, or the code of the local agency or authority having jurisdiction.

The Contractor shall make no connections or splices of any kind in cables installed in conduits or duct banks.

Unless otherwise designated in the plans, where ducts are in tiers, use the lowest ducts to receive the cable first, with spare ducts left in the upper levels. Check duct routes prior to construction to obtain assurance that the shortest routes are selected and interferences are avoided.

Duct banks or conduits shall be installed as a separate item in accordance with Item L-110, "Airport Underground Electrical Duct Banks and Conduit." The Contractor shall run a mandrel through duct banks or conduit prior to installation of cable to insure that the duct bank or conduit is open, continuous and clear of debris. Mandrel size shall be compatible with conduit size. The Contractor shall swab out all conduits/ducts and clean base can, manhole, etc. interiors IMMEDIATELY prior to pulling cable. Once cleaned and swabbed the base cans and all accessible points of entry to the duct/conduit system shall be kept closed except when installing cables. Cleaning of ducts, base cans, manholes, etc. is incidental to the pay item of the item being cleaned. All raceway systems left open, after initial cleaning, for any reason shall be recleaned at the Contractor's expense. All accessible points shall be kept closed when not installing cable. The Contractor shall verify existing ducts proposed for use in this project as clear and open. The Contractor shall notify the Engineer of any blockage in the existing ducts. The cable shall be installed in a manner to prevent harmful stretching of the conductor, injury to the insulation, or damage to the outer protective covering. The ends of all cables shall be sealed with moisture-seal tape providing moisture-tight mechanical protection with minimum bulk, or alternately, heat shrinkable tubing before pulling into the conduit and it shall be left sealed until connections are made. Where more than one cable is to be installed in a conduit, all cable shall be pulled in the conduit at the same time. The pulling of a cable through duct banks or conduits may be accomplished by hand winch or power winch with the use of cable grips or pulling eyes. Maximum pulling tensions shall be governed by cable manufacturer's recommendations. A non-hardening lubricant recommended for the type of cable being installed shall be used where pulling lubricant is required.

Contractor shall submit pulling tension values to the Engineer prior to any cable installation. If required by the Engineer, pulling tension values for cable pulls shall be monitored by a dynamometer in the presence of the Engineer. Cable pull tensions shall be recorded by the Contractor and reviewed by the Engineer. Cables exceeding the maximum allowable pulling tension values shall be removed and replaced by the Contractor at the Contractor's expense.

The manufacturer's minimum bend radius or the NEC requirements whichever is more restrictive shall apply. Cable installation, handling and storage shall be per manufacturer's recommendations. During cold weather, particular

attention shall be paid to the manufacturer's minimum installation temperature. Cable shall not be installed when the temperature is at or below the manufacturer's minimum installation temperature. At the Contractor's option, the Contractor may submit a plan, for review by the Engineer, for heated storage of the cable and maintenance of an acceptable cable temperature during installation when temperatures are below the manufacturer's minimum cable installation temperature.

Cable shall not be dragged across base can or manhole edges, pavement or earth. When cable must be coiled, lay cable out on a canvas tarp or use other appropriate means to prevent abrasion to the cable jacket.

108-3.3 SPLICING. Connections of the type shown on the plans shall be made by experienced personnel regularly engaged in this type of work and shall be made as follows:

a. Field-attached Plug-in Splices. These shall be assembled in accordance with manufacturer's instructions. These splices shall be made by plugging directly into mating connectors. In all cases the joint where the connectors come together shall be wrapped with at least one layer of rubber or synthetic rubber tape and one layer of plastic tape, one-half lapped, extending at least 1-1/2 in (37 mm) on each side of the joint.

108-3.4 BARE COUNTERPOISE WIRE INSTALLATION FOR LIGHTNING PROTECTION AND GROUNDING. If shown on the plans or included in the job specifications, bare counterpoise copper wire shall be installed for lightning protection of the underground cables. Counterpoise wire shall be installed in the same trench for the entire length of buried cable, conduits and duct banks that are installed to contain airfield cables. Where the cable or duct/conduit trench runs parallel to the edge of pavement, the counterpoise shall be installed in a separate trench located half the distance between the pavement edge and the cable or duct/conduit trench. In trenches not parallel to pavement edges, counterpoise wire shall be installed continuously a minimum of 4 in above the cable, conduit or duct bank, or as shown on the plans if greater. Additionally, counterpoise wire shall be installed at least 8 in below the top of subgrade in paved areas or 10 in below finished grade in un-paved areas. This dimension may be less than 4 in where conduit is to be embedded in existing pavement. Counterpoise wire shall not be installed in conduit.

The counterpoise wire shall be routed around to each light fixture base, mounting stake, or junction/access structures. The counterpoise wire shall also be exothermically welded to ground rods installed as shown on the plans but not more than 500 ft (150 m) apart around the entire circuit.

The counterpoise system shall be continuous and terminate at the transformer vault or at the power source. It shall be securely attached to the vault or equipment external ground ring or other made electrode grounding system. The connections shall be made as shown on the plans and in the specifications.

If shown on the plans or in the specifications, a separate equipment (safety) ground system shall be provided in addition to the counterpoise wire using one of the following methods:

(1) A ground rod installed at and securely attached to each light fixture base, mounting stake if painted, and to all metal surfaces at junction/access structures.

(2) Install an insulated equipment ground conductor internal to the conduit system and securely attached it to each light fixture base and to all metal surfaces at junction/access structures. This equipment ground conductor shall also be exothermically welded to ground rods installed not more than 500 feet (150 m) apart around the circuit.

a. Counterpoise Installation Above Multiple Conduits and Duct Banks. Counterpoise wires shall be installed above multiple conduits/duct banks for airfield lighting cables, with the intent being to provide a complete cone of protection over the airfield lighting cables. When multiple conduits and/or duct banks for airfield cable are installed in the same trench, the number and location of counterpoise wires above the conduits shall be adequate to provide a complete cone of protection measured 22 1/2 degrees each side of vertical.

Where duct banks pass under pavement to be constructed in the project, the counterpoise shall be placed above the duct bank. Reference details on the construction plans.

b. Counterpoise Installation at Existing Duct Banks. When airfield lighting cables are indicated on the plans to be routed through existing duct banks, the new counterpoise wiring shall be terminated at ground rods at each end of the existing duct bank where the cables being protected enter and exit the duct bank. The new counterpoise conductor shall be bonded to the existing counterpoise system.

108-3.5 EXOTHERMIC BONDING. Bonding of counterpoise wire shall be by the exothermic welding process. Only personnel experienced in and regularly engaged in this type of work shall make these connections.

Contractor shall demonstrate to the satisfaction of the Engineer, the welding kits, materials and procedures to be used for welded connections prior to any installations in the field. The installations shall comply with the manufacturer's recommendations and the following:

a. All slag shall be removed from welds.

b. For welds at light fixture base cans, all galvanized coated surface areas and "melt" areas, both inside and outside of base cans, damaged by exothermic bond process shall be restored by coating with a liquid cold-galvanizing compound conforming to U.S. Navy galvanized repair coating meeting Mil. Spec. MIL-P-21035. Surfaces to be coated shall be prepared and compound applied in accordance with manufacturer's recommendations.

c. All buried copper and weld material at weld connections shall be thoroughly coated 6 mil of 3M "Scotchkote," or approved equivalent, or coated with coal tar Bitumastic® material to prevent surface exposure to corrosive soil or moisture.

108-3.6 TESTING. The Contractor shall furnish all necessary equipment and appliances for testing the airport electrical systems and underground cable circuits before and after installation. The Contractor shall perform all tests in the presence of the Engineer. The Contractor shall demonstrate the electrical characteristics to the satisfaction of the Engineer. All costs for testing are incidental to the respective item being tested. For phased projects, the tests must be completed by phase and results meeting the specifications below must be maintained by the Contractor throughout the entire project as well as during the ensuing warranty period.

Earth resistance testing methods shall be submitted to the Engineer for approval. Earth resistance testing results shall be recorded on an approved form and testing shall be performed in the presence of the Engineer. All such testing shall be at the sole expense of the Contractor.

Should the counterpoise or ground grid conductors be damaged or suspected of being damaged by construction activities the Contractor shall test the conductors for continuity with a low resistance ohmmeter. The conductors shall be isolated such that no parallel path exists and tested for continuity. The Engineer shall approve of the test method selected. All such testing shall be at the sole expense of the Contractor.

After installation, the Contractor shall test and demonstrate to the satisfaction of the Engineer the following:

a. That all affected lighting power and control circuits (existing and new) are continuous and free from short circuits.

b. That all affected circuits (existing and new) are free from unspecified grounds.

c. That the insulation resistance to ground of all new non-grounded series circuits or cable segments is not less than 50 megohms.

d. That the insulation resistance to ground of all non-grounded conductors of new multiple circuits or circuit segments is not less than 50 megohms.

e. That all affected circuits (existing and new) are properly connected in accordance with applicable wiring diagrams.

f. That all affected circuits (existing and new) are operable. Tests shall be conducted that include operating each control not less than 10 times and the continuous operation of each lighting and power circuit for not less than 1/2 hour.

g. That the impedance to ground of each ground rod does not exceed 25 ohms prior to establishing connections to other ground electrodes. The fall-of-potential ground impedance test shall be used, as described by ANSI/IEEE Standard 81, to verify this requirement.

Two copies of tabulated results of all cable tests performed shall be supplied by the Contractor to the Engineer. Where connecting new cable to existing cable, ground resistance tests shall be performed on the new cable prior to connection to the existing circuit.

There are no approved "repair" procedures for items that have failed testing other than complete replacement.

METHOD OF MEASUREMENT

108-4.1 Trenching shall be measured by the linear feet of trench, including the excavation, backfill, and restoration, completed, measured as excavated, and accepted as satisfactory.

When specified, separate measurement shall be made for trenches of various specified widths.

The cost of all excavation, backfill, dewatering and restoration regardless of the type of material encountered shall be included in the unit price bid for the work.

108-4.2 Cable or counterpoise wire installed in trench, duct bank or conduit shall be measured by the number of linear feet of cable or counterpoise wire installed in trenches, duct bank or conduit, including ground rods and grounding connectors, and trench marking tape ready for operation, and accepted as satisfactory. Separate measurement shall be made for each cable or counterpoise wire installed in trench, duct bank or conduit. The measurement for this item **shall** include additional quantities required for slack. Cable and counterpoise slack is considered incidental to this item and is included in the contractor's unit price. No separate measurement or payment will be made for cable or counterpoise slack.

BASIS OF PAYMENT

108-5.1 Payment will be made at the contract unit price for trenching, cable and bare counterpoise wire installed in trench (direct-buried), or cable and equipment ground installed in duct bank or conduit, in place by the Contractor and accepted by the Engineer. This price shall be full compensation for furnishing all materials and for all preparation and installation of these materials, and for all labor, equipment, tools, and incidentals, including ground rods and ground connectors and trench marking tape, necessary to complete this item.

Payment will be made under:

Item L-108-1	No. 8 AWG L-824C Cable, installed in duct bank or conduit-per linear foot
Item L-108-2	No. 6 AWG L-824C Cable, installed in duct bank or conduit-per linear foot
Item L-108-3	Bare Counterpoise Wire, installed in trench, duct bank or conduit, including ground rods and ground connectors-per linear foot

MATERIAL REQUIREMENTS

AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-26	Specification for L-823 Plug and Receptacle Cable Connectors
FED SPEC J-C-30	Cable and Wire, Electrical Power, Fixed Installation (cancelled; replaced by A-A-59544 Cable and Wire, Electrical (Power, Fixed Installation))
FED SPEC A-A-55809	Insulation Tape, Electrical, Pressure-Sensitive Adhesive, Plastic
ASTM B 3	Soft or Annealed Copper Wire
ASTM D 4388	Rubber tapes, Nonmetallic Semiconducting and Electrically Insulating

REFERENCE DOCUMENTS

NFPA No. 70	National Electrical Code (NEC)
MIL-S-23586C	Sealing Compound, Electrical, Silicone Rubber

NN Building Industry Consulting Service International (BICSI)

ANSI/IEEE Std 81 IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System

END OF ITEM L-108

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ITEM L-109
AIRPORT TRANSFORMER VAULT AND VAULT EQUIPMENT

CONTRACT DOCUMENTS

109-0.1 This section of these specifications is a part of the Contract Documents as defined in the Contract Articles. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other sections.

Attention shall be directed to the sections of these specifications entitled, "Summary of Work and Special Work Requirements" and "Supplemental Contract Articles".

DESCRIPTION

109-1.1 This item shall consist of the furnishing of all new vault equipment, wiring, electrical buses, cable, and conduit. This work shall also include the painting of equipment and conduit; the marking and labeling of equipment and the labeling or tagging of wires; the testing of the installation; and the furnishing of all incidentals necessary to place it in operating condition as a completed unit to the satisfaction of the Engineer.

Attention shall be directed to the sections of these specifications entitled, "Summary of Work and Special Work Requirements" and "Supplemental Contract Articles".

EQUIPMENT AND MATERIALS

109-2.1 GENERAL.

a. Airport lighting equipment and materials covered by Federal Aviation Administration (FAA) specifications shall be certified and listed under Advisory Circular (AC) 150/5345-53, Airport Lighting Equipment Certification Program.

b. All other equipment and materials covered by other referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when requested by the Engineer.

c. Manufacturer's certifications shall not relieve the Contractor of the Contractor's responsibility to provide materials in accordance with these specifications and acceptable to the Engineer. Materials supplied and/or installed that do not materially comply with these specifications shall be removed, when directed by the Engineer and replaced with materials, which do comply with these specifications, at the sole cost of the Contractor.

d. All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify pertinent products or models applicable to this project. Indicate all optional equipment and delete non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment for which they apply on each submittal sheet. Markings shall be boldly and clearly made with arrows or circles (highlighting is not acceptable). Contractor is solely responsible for delays in project accruing directly or indirectly from late submissions or resubmissions of submittals.

e. The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications. The Engineer reserves the right to reject any and all equipment, materials or procedures, which, in the Engineer's opinion, does not meet the system design and the standards and codes, specified herein.

f. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from final acceptance by the Owner. The

defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

107-2.2 Metal Conduit and Tubing. Rigid galvanized steel conduit and fitting shall be in accordance with Fed. Spec. WW-C-581. Conduit size is scheduled on the plans and shall be ¾ inch minimum.

107-2.3 Submittals - Manufacturer's technical product data, including specifications and installation instructions, for each type of raceway system are required. Include data substantiating that materials comply with requirements.

Provide dimensioned drawings of raceway systems showing layout of raceways and fittings, spatial relationships to associated equipment, and adjoining raceways, if any. Show connections to electrical power panels and feeders.

Provide maintenance data and parts lists for each type of raceway system installed, including furnished specialties and accessories. Include this data, product data, and shop drawings in maintenance manual.

109-2.4 RIGID STEEL CONDUIT. Rigid steel conduit and fittings shall be in accordance with Underwriters Laboratories Standard 6 and 514.

109-2.5 FAA-APPROVED EQUIPMENT. Certain items of airport lighting equipment installed in vaults are covered by individual FAA equipment specifications. The specifications are listed below:

AC 150/5345-7 Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits

AC 150/5345-10 Specification for Constant Current Regulators and Regulator Monitors

AC 150/5345-13 Specification for L-841 Auxiliary Relay Cabinet Assembly for Pilot Control of Airport Lighting Circuits.

109-2.6 OTHER ELECTRICAL EQUIPMENT. Constant-current regulators, distribution transformers, cutouts, relays, terminal blocks, transfer relays, circuit breakers, and all other regularly used commercial items of electrical equipment not covered by FAA equipment specifications shall conform to the applicable rulings and standards of the Institute of Electrical and Electronic Engineers or the National Electrical Manufacturers Association. When specified, test reports from a testing laboratory indicating that the equipment meets the specifications shall be supplied. In all cases, equipment shall be new and a first-grade product. This equipment shall be supplied in the quantities required for the specific project and shall incorporate the electrical and mechanical characteristics specified in the proposal and plans.

109-2.7 WIRE. Wire in conduit rated up to 5,000 volts shall conform to AC 150/5345-7, Specification for L-824 Underground Electrical Cables for Airport Lighting Circuits, for rubber insulated neoprene-covered wire, or Fed. Spec. J-C-30, Type RHW, for rubber insulated fibrous-covered wire. For ratings up to 600 volts, thermoplastic wire conforming to Fed. Spec. J-C-30, Types TW, THW, and THWN, shall be used. The wires shall be of the type, size, number of conductors, and voltage shown in the plans or in the proposal.

a. Control Circuits. Unless otherwise indicated on the plans, wire shall be not less than No. 12 AWG and shall be insulated for 600 volts.

b. Power Circuits.

(1) 600 volts maximum-Wire shall be No. 6 AWG or larger and insulated for at least 600 volts.

CONSTRUCTION METHODS

109-3.1 GENERAL. The Contractor shall furnish, install, and connect all equipment, equipment accessories, conduit, cables, wires, grounds, and support necessary to ensure a complete and operable electrical distribution center for the airport lighting system as specified herein and shown in the plans.

The equipment installation and mounting shall comply with the requirements of the National Electrical Code and local code agency having jurisdiction.

Examine areas and conditions under which raceways are to be installed, and substrate which will support raceways. Notify General Contractor in writing of conditions detrimental to proper completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

Coordinate installation with the Owner's occupants. Coordination shall include attending a coordination meeting and providing a schedule of activities that relate to the construction. The Contractor shall be prepared to alter the work times to accommodate the Owner's occupants.

109-3.2 POWER SUPPLY EQUIPMENT. Transformers, regulators, booster transformers, and other power supply equipment items shall be furnished and installed at the location shown in the plans or as directed by the Engineer.

109-3.3 CABLE ENTRANCE. Incoming underground cable from field circuits will be installed outside the walls of the transformer vault as a separate item under Item L-108. The Contractor installing the vault equipment shall bring the cables from the trench or duct through the entrance conduits into the vault and make the necessary electrical connections.

109-3.4 WIRING AND CONNECTIONS. The Contractor shall make all necessary electrical connections in the vault in accordance with the wiring diagrams furnished and as directed by the Engineer. In wiring to the terminal blocks, the Contractor shall leave sufficient extra length on each control lead to make future changes in connections at the terminal block. This shall be accomplished by running each control lead the longest way around the box to the proper terminal. Leads shall be neatly laced in place.

109-3.5 MARKING AND LABELING. All equipment, control wires, terminal blocks, etc., shall be tagged, marked, or labeled as specified below:

a. Wire Identification. The Contractor shall furnish and install self-sticking wire labels or identifying tags on all control wires at the point where they connect to the control equipment or to the terminal blocks. Wire labels, if used, shall be of the self-sticking preprinted type and of the manufacturer's recommended size for the wire involved. Identification -markings designated in the plans shall be followed. Tags, if used, shall be of fiber not less than 3/4 in (13 mm) in diameter and not less than 1/32 in (1 mm) thick. Identification markings designated in the plans shall be stamped on tags by means of small tool dies. Each tag shall be securely tied to the proper wire by a nonmetallic cord.

b. Labels. The Contractor shall stencil identifying labels on the cases of regulators, breakers, and distribution and control relay cases with white oil paint as designated by the Engineer. The letters and numerals shall be not less than 1 in (25 mm) in height and shall be of proportionate width. The Contractor shall also mark the correct circuit designations in accordance with the wiring diagram on the terminal marking strips, which are a part of each terminal block.

109-3.6 INSTALLATION OF RACEWAYS - Install raceways as indicted; in accordance with manufacturer's written installation instructions, and in compliance with NEC, and NECA's "Standards of Installation". Install units plumb and level, and maintain manufacturer's recommended clearances.

Coordinate with other work including wires/cables, boxes, and panel work, as necessary to interface installation of electrical raceways and components with other work.

Mechanically fasten together metal conduits, enclosures, and raceways for conductors to form continuous electrical conductor. Connect to electrical boxes, fittings and cabinets to provide electrical continuity and firm mechanical assembly.

Avoid use of dissimilar metals throughout system to eliminate possibility of electrolysis. Where dissimilar metals are in contact, coat surfaces with corrosion inhibiting compound before assembling.

Install miscellaneous fittings such as reducers, chase nipples, 3-piece unions, split couplings, and plugs that have been specifically designed and manufactured for their particular application. Install expansion fittings in raceways required or wherever structural expansion joints are crossed.

Use roughing-in dimensions of electrically operated units furnished by supplier. Set conduit and boxes for connection to units only after receiving review of dimensions and after checking location with other trades.

Provide nylon pull cord in all empty conduits. Test conduits required to be installed, but left empty, with ball mandrel. Clear any conduit which rejects ball mandrel. Pay costs involved for restoration of conduit and surrounding surfaces to original condition.

109-3.7 RIGID STEEL CONDUIT - Provide rigid steel zinc-coated conduit where embedded in concrete, masonry, earth, or installed outdoors above grade.

Cut conduits straight, properly ream, and cut threads for heavy wall conduit deep and clean.

Field-bend conduit with benders designed for purpose so as not to distort nor vary internal diameter.

Size conduits to meet NEC, except to conduit smaller than ¾ inch shall be embedded in concrete or masonry.

Fasten conduit terminations in sheet metal enclosures by 2 locknuts, and terminate with bushing. Install locknuts inside and outside enclosure.

Conduits are not to cross pipe shafts, or ventilating duct openings.

Use of running threads at conduits joints and terminations is prohibited. Where required, use 3-piece union or split coupling.

Complete installation of electrical raceways before starting installation of cable/wire within raceways.

Metallic raceways installed underground or outside are to have conduit threads painted with corrosion inhibiting compound before couplings are assembled. Draw up coupling and conduit sufficiently tight to ensure watertightness. The Engineer shall inspect all underground conduits prior to backfill or pouring of concrete.

Install underground conduits minimum of 24" below finished grade, unless otherwise indicated on the plans.

Install conduits as not to damage or run through structural members. Avoid horizontal or cross runs in building partitions or side walls.

Install exposed conduits and extensions from concealed conduit systems neatly, parallel with, or at right angles to walls of building.

Install exposed conduit work as not to interfere with ceiling inserts, lights or ventilation ducts or outlets.

Support exposed conduits by use of hangers, clamps, or clips.

The above requirements for exposed conduits also apply to conduits installed in space above hung ceilings.

Rigid steel conduit (RGS) shall not be paid for separately but rather shall be incidental to the project.

109-3.8 CONDUIT FITTINGS - Construct locknuts for securing conduit to metal enclosure with sharp edge for digging into metal, and ridged outside circumference for proper fastening.

Bushing for terminating conduits smaller than 1-¼" are to have flared bottom and ribbed sides, with smooth upper edges to prevent injury to cable insulation.

Install insulated type bushings for terminating conduits 1-¼" and larger. Bushings are to have flared bottom and ribbed sides. Upper edge to have phenolic insulating ring molded into bushing.

Bushing of standard of insulated type to have screw type grounding terminal.

Miscellaneous fittings such as reducers, chase nipples, 3-piece unions, split couplings, and plugs to be specifically designed for their particular application.

METHOD OF MEASUREMENT

109-4.1 The constant current regulator, constant current regulator control box, cable, conduit, transformer, circuit breakers, and miscellaneous work to be paid for with a lump sum shall consist of all equipment installed, connected, and accepted as a complete unit ready for operation. Cable installed outside of vault shall be paid for separately under another pay item.

BASIS OF PAYMENT

109-5.1 Payment will be made at the contract unit price for each completed and accepted vault or prefabricated metal housing equipment installation. This price shall be full compensation for furnishing all materials and for all

preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item L-109-1	Miscellaneous Work in Vault	per Lump Sum
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MATERIAL REQUIREMENTS

AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-10	Specification for Constant Current Regulators and Regulator Monitors
AC 150/5345-13A	Specification for L-841 Auxiliary Relay Cabinet Assembly for Pilot Control of Airport Lighting Circuits
FED SPEC J-C-30	Cable and Wire, Electrical (Power, Fixed Installation) (cancelled; replaced by AA-59544 Cable and Wire, Electrical (Power, Fixed Installation))

Master Painter's Institute

REFERENCE DOCUMENTS

Electrical Spec. 16050	Electrical Requirements
Electrical Spec. 16110	Raceways
Electrical Spec. 16130	Cabinets, Boxes, and Fittings
Electrical Spec. 16195	Electrical Identification
Electrical Spec. 16450	Grounding
Electrical Spec. 16476	Disconnect Switches and Circuit Breakers

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ITEM L-110
AIRPORT UNDERGROUND ELECTRICAL DUCT BANKS AND CONDUITS

CONTRACT DOCUMENTS

110-0.1 This section of these specifications is a part of the Contract Documents as defined in the Contract Articles. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other sections.

Attention shall be directed to the sections of these specifications entitled, "Summary of Work and Special Work Requirements" and "Supplemental Contract Articles".

DESCRIPTION

110-1.1 This item shall consist of underground electrical conduits and duct banks (single or multiple conduits encased in concrete) installed in accordance with this specification at the locations and in accordance with the dimensions, designs, and details shown on the plans. This item shall include furnishing and installing of all underground electrical duct banks and individual and multiple underground conduits. It shall also include all turfing, trenching, backfilling, removal, and restoration of any paved or turfed areas; concrete encasement, mandreling, pulling lines, duct markers, plugging of conduits, and the testing of the installation as a completed system ready for installation of cables in accordance with the plans and specifications. This item shall also include furnishing and installing conduits and all incidentals for providing positive drainage of the system. Verification of existing ducts is incidental to the pay items provided in this specification.

Attention shall be directed to the sections of these specifications entitled, "Summary of Work and Special Work Requirements" and "Supplemental Contract Articles".

EQUIPMENT AND MATERIALS

110-2.1 GENERAL.

a. All equipment and materials covered by referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when so requested by the Engineer.

b. Manufacturer's certifications shall not relieve the Contractor of the Contractor's responsibility to provide materials in accordance with these specifications and acceptable to the Engineer. Materials supplied and/or installed that do not materially comply with these specifications shall be removed, when directed by the Engineer and replaced with materials, which do comply with these specifications, at the sole cost of the Contractor.

c. All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify pertinent products or models applicable to this project. Indicate all optional equipment and delete non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment for which they apply on each submittal sheet. Markings shall be boldly and clearly made with arrows or circles (highlighting is not acceptable). Contractor is solely responsible for delays in project accruing directly or indirectly from late submissions or resubmissions of submittals.

d. The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications. The Contractor's submittals shall be neatly bound in a properly sized 3-ring binder, tabbed by specification section. The Engineer reserves the right to reject any and all equipment, materials or procedures, which, in the Engineer's opinion, does not meet the system design and the standards and codes, specified herein.

e. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

110-2.2 STEEL CONDUIT. Rigid galvanized steel conduit and fittings shall be hot dipped galvanized inside and out and conform to the requirements of Underwriters Laboratories Standard 6, 514B, and 1242.

110-2.3 PLASTIC CONDUIT. Plastic conduit and fittings shall conform to the requirements of Fed. Spec. W--C-1094, Underwriters Laboratories Standards UL-651 and Article 352 of the current National Electrical Code shall be one of the following, as shown on the plans:

- a. Type I--Schedule 40 PVC suitable for underground use either direct-buried or encased in concrete.
- b. Type II--Schedule 40 PVC suitable for either above ground or underground use.

The type of adhesive shall be as recommended by the conduit/fitting manufacturer.

110-2.4 SPLIT CONDUIT. Split conduit shall be pre-manufactured for the intended purpose and shall be made of steel or plastic.

110-2.5 CONDUIT SPACERS. Conduit spacers shall be prefabricated interlocking units manufactured for the intended purpose. They shall be of double wall construction made of high grade, high density polyethylene complete with interlocking cap and base pads. They shall be designed to accept No. 4 reinforcing bars installed vertically.

110-2.6 CONCRETE. Concrete shall conform to Item P-610, Structural Portland Cement Concrete, using 1 inch maximum size coarse aggregate with a minimum 28 day compressive strength of 4000 psi. Where reinforced duct banks are specified, reinforcing steel shall conform to ASTM A 615 Grade 60. Concrete and reinforcing steel are incidental to the respective pay item of which they are a component part.

110-2.7 FLOWABLE BACKFILL. Flowable material used to back fill conduit and duct bank trenches shall conform to the requirements of Item P-153 "Controlled Low Strength Material".

110-2.8 DETECTABLE WARNING TAPE Plastic, detectable, yellow magnetic tape shall be polyethylene film with a metallized foil core and shall be 4 - 6 in (75 - 150 mm) wide. Detectable tape is incidental to the respective bid item.

CONSTRUCTION METHODS

110-3.1 GENERAL. The Contractor shall install underground duct banks and conduits at the approximate locations indicated on the plans. The Engineer shall indicate specific locations as the work progresses, if required to differ from the plans. Duct banks and conduits shall be of the size, material, and type indicated on the plans or specifications. Where no size is indicated on the plans or in the specifications, conduits shall be not less than 2 in (50 mm) inside diameter or comply with the National Electrical Code based on cable to be installed, whichever is larger. All duct bank and conduit lines shall be laid so as to grade toward access points and duct or conduit ends for drainage. Unless shown otherwise on the plans, grades shall be at least 3 in (75 mm) per 100 feet (30 m). On runs where it is not practicable to maintain the grade all one way, the duct bank and conduit lines shall be graded from the center in both directions toward access points or conduit ends, with a drain into the storm drainage system. Pockets or traps where moisture may accumulate shall be avoided. No duct bank or underground conduit shall be less than 18 in below finished grade. Where under pavement, the top of the duct bank shall not be less than 18 in below the subgrade.

The Contractor shall mandrel each individual conduit whether the conduit is direct-buried or part of a duct bank. An iron-shod mandrel, not more than 1/4 in (6 mm) smaller than the bore of the conduit shall be pulled or pushed through each conduit. The mandrel shall have a leather or rubber gasket slightly larger than the conduit hole.

The Contractor shall swab out all conduits/ducts and clean base can, manhole, pull boxes, etc. interiors IMMEDIATELY prior to pulling cable. Once cleaned and swabbed the base cans, manhole, pull boxes, etc. and all accessible points of entry to the duct/conduit system shall be kept closed except when installing cables. Cleaning of ducts, base cans, manholes, etc. is incidental to the pay item of the item being cleaned. All raceway systems left

open, after initial cleaning, for any reason shall be recleaned at the Contractor's expense. All accessible points shall be kept closed when not installing cable. The Contractor shall verify existing ducts proposed for use in this project as clear and open. The Contractor shall notify the Engineer of any blockage in the existing ducts.

For pulling the permanent wiring, each individual conduit, whether the conduit is direct-buried or part of a duct bank, shall be provided with a 200 pound test polypropylene pull rope. The ends shall be secured and sufficient length shall be left in access points to prevent it from slipping back into the conduit. Where spare conduits are installed, as indicated on the plans, the open ends shall be plugged with removable tapered plugs, designed for this purpose.

All conduits shall be securely fastened in place during construction and shall be plugged to prevent contaminate from entering the conduits. Any conduit section having a defective joint shall not be installed. Ducts shall be supported and spaced apart using approved spacers at intervals not to exceed 5 feet.

Unless otherwise shown on the plans, concrete encased duct banks shall be used when crossing under pavements expected to carry aircraft loads.

Where turf is well established and the sod can be removed, it shall be carefully stripped and properly stored.

Trenches for conduits and duct banks may be excavated manually or with mechanical trenching equipment unless in pavement, in which case they shall be excavated with mechanical trenching equipment. Walls of trenches shall be essentially vertical so that a minimum of shoulder surface is disturbed. Blades of graders shall not be used to excavate the trench.

When rock is encountered, the rock shall be removed to a depth of at least 3 in below the required conduit or duct bank depth and it shall be replaced with bedding material of earth or sand containing no mineral aggregate particles that would be retained on a 1/4 in sieve. Flowable backfill may alternatively be used. The Contractor shall ascertain the type of soil or rock to be excavated before bidding. All such rock removal shall be performed and paid for under Item P-152.

Underground electrical warning (Caution) tape shall be installed in the trench above all underground duct banks and conduits in unpaved areas. Contractor shall submit a sample of the proposed warning tape for approval by the Engineer. If not shown on the plans, the warning tape shall be located six in above the duct/conduit or the counterpoise wire if present.

Joints in plastic conduit shall be prepared in accordance with the manufacturer's recommendations for the particular type of conduit. Plastic conduit shall be prepared by application of a plastic cleaner and brushing a plastic solvent on the outside of the conduit ends and on the inside of the couplings. The conduit fitting shall then be slipped together with a quick one-quarter turn twist to set the joint tightly. Where more than one conduit is placed in a single trench, or in duct banks, joints in the conduit shall be staggered a minimum of 2 feet.

Changes in direction of runs exceeding 10 degrees, either vertical or horizontal, shall be accomplished using manufactured sweep bends.

Whether or not specifically indicated on the drawings, where the soil encountered at established duct bank grade is an unsuitable material, as determined by the Engineer, the unsuitable material shall be removed in accordance with Item P-152 and replaced with suitable material. Alternatively, additional duct bank supports that are adequate and stable shall be installed, as approved by the Engineer.

All excavation shall be unclassified and shall be considered incidental to the respective L-110 pay item of which it is a component part. Dewatering necessary for duct installation, erosion and turbidity control, in accordance with Federal, State, and Local requirements is incidental to its respective pay item as a part of Item L-110. The cost of all excavation regardless of type of material encountered, shall be included in the unit price bid for the L-110 Item.

Unless otherwise specified, excavated materials that are deemed by the Engineer to be unsuitable for use in backfill or embankments shall be removed and disposed of offsite.

Any excess excavation shall be filled with suitable material approved by the Engineer and compacted in accordance with item P-152.

It is the Contractor's responsibility to locate existing utilities within the work area prior to excavation. Where existing active cables) cross proposed installations, the Contractor shall insure that these cables are adequately

protected. Where crossings are unavoidable, no splices will be allowed in the existing cables, except as specified on the plans. Installation of new cable where such crossings must occur shall proceed as follows:

(1) Existing cables shall be located manually. Unearthed cables shall be inspected to assure absolutely no damage has occurred

(2) Trenching, etc., in cable areas shall then proceed with approval of the Engineer, with care taken to minimize possible damage or disruption of existing cable, including careful backfilling in area of cable.

In the event that any previously identified cable is damaged during the course of construction, the Contractor shall be responsible for the complete repair.

110-3.2 DUCT BANKS. Unless otherwise shown in the plans, duct banks shall be installed so that the top of the concrete envelope is not less than 18 in (45 cm) below the bottom of the base or stabilized base course layers where installed under runways, taxiways, aprons, or other paved areas, and not less than 18 in (45 cm) below finished grade where installed in unpaved areas.

Unless otherwise shown on the plans, duct banks under paved areas shall extend at least 3 feet (90 cm) beyond the edges of the pavement or 3 feet (90 cm) beyond any underdrains that may be installed alongside the paved area. Trenches for duct banks shall be opened the complete length before concrete is placed so that if any obstructions are encountered, proper provisions can be made to avoid them. Unless otherwise shown on the plans, all duct banks shall be placed on a layer of concrete not less than 3 in (75 mm) thick prior to its initial set. Where two or more conduits in the duct bank are intended to carry conductors of equivalent voltage insulation rating, the Contractor shall space the conduits not less than 1-1/2 in (37 mm) apart (measured from outside wall to outside wall). Where two or more conduits in the duct bank are intended to carry conductors of differing voltage insulation rating, the Contractor shall space the conduits not less than 3 in apart (measured from outside wall to outside wall). All such multiple conduits shall be placed using conduit spacers applicable to the type of conduit. As the conduit laying progresses, concrete shall be placed around and on top of the conduits not less than 3 in (75 mm) thick unless otherwise shown on the plans. End bells or couplings shall be installed flush with the concrete encasement at access points.

Conduits forming the duct bank shall be installed using conduit spacers. No. 4 reinforcing bars shall be driven vertically into the soil a minimum of 6 in to anchor the assembly into the earth prior to placing the concrete encasement. For this purpose, the spacers shall be fastened down with locking collars attached to the vertical bars. Spacers shall be installed at 5 ft intervals. Spacers shall be in the proper sizes and configurations to fit the conduits. Locking collars and spacers shall be submitted to the Engineer for review prior to use.

When specified, the Contractor shall reinforce the bottom side and top of encasements with steel reinforcing mesh or fabric or other approved metal reinforcement. When directed, the Contractor shall supply additional supports where the ground is soft and boggy, where ducts cross under roadways, or where shown on the plans. Under such conditions, the complete duct structure shall be supported on reinforced concrete footings, piers, or piles located at approximately 5 ft (150 cm) intervals.

All pavement surfaces that are to have ducts installed therein shall be neatly saw cut to form a vertical face. All excavation shall be included in the contract with price for the duct.

Install a plastic, detectable, color as noted, 4 - 6 in (75 - 150 mm) wide tape 8 in (200 mm) minimum below grade above all underground conduit or duct lines not installed under pavement.

When existing cables are to be placed in split duct, encased in concrete, the cable shall be carefully located and exposed by hand tools. Prior to being placed in duct, the Engineer shall be notified so that he may inspect the cable and determine that it is in good condition. Where required, split duct shall be installed as shown on the drawings or as required by the Engineer.

110-3.3 CONDUITS WITHOUT CONCRETE ENCASEMENT. Trenches for single-conduit lines shall be not less than 6 in (150 mm) nor more than 12 in (300 mm) wide, and the trench for 2 or more conduits installed at the same level shall be proportionately wider. Trench bottoms for conduits without concrete encasement shall be made to conform accurately to grade so as to provide uniform support for the conduit along its entire length.

Unless otherwise shown on the plans, a layer of fine earth material, at least 4 in (100 mm) thick (loose measurement) shall be placed in the bottom of the trench as bedding for the conduit. The bedding material shall

consist of soft dirt, sand or other fine fill, and it shall contain no particles that would be retained on a 1/4 in (6 mm) sieve. The bedding material shall be tamped until firm. Flowable backfill may alternatively used.

Unless otherwise shown on plans, conduits shall be installed so that the tops of all conduits are at least 18 in (45 cm) below the finished grade.

When two or more individual conduits intended to carry conductors of equivalent voltage insulation rating are installed in the same trench without concrete encasement, they shall be spaced not less than 2 in (50 mm) apart (measured from outside wall to outside wall) in a horizontal direction and not less than 6 in (150 mm) apart in a vertical direction. Where two or more individual conduits intended to carry conductors of differing voltage insulation rating are installed in the same trench without concrete encasement, they shall spaced not less than 3 in (75 mm) apart (measured from outside wall to outside wall) in a horizontal direction and lot less than 6 in (150 mm) apart in a vertical direction.

Trenches shall be opened the complete length between normal termination points before conduit is installed so that if any unforeseen obstructions are encountered, proper provisions can be made to avoid them.

Conduits shall be installed using conduit spacers. No. 4 reinforcing bars shall be driven vertically into the soil a minimum of 6 in to anchor the assembly into the earth while backfilling. For this purpose, the spacers shall be fastened down with locking collars attached to the vertical bars. Spacers shall be installed at 5 ft intervals. Spacers shall be in the proper sizes and configurations to fit the conduits. Locking collars and spacers shall be submitted to the Engineer for review prior to use.

110-3.4 MARKERS. The location of each end and of each change of direction of conduits and duct banks shall be marked by a concrete slab marker 2 feet (60 cm) square and 4 - 6 in (100 - 150 mm) thick extending approximately 1 in (25 mm) above the surface. The markers shall also be located directly above the ends of all conduits or duct banks, except where they terminate in a junction/access structure or building.

The Contractor shall impress the word "DUCT" or "CONDUIT" on each marker slab. The Contractor shall also impress on the slab the number and size of conduits beneath the marker along with all other necessary information as determined by the Engineer. The letters shall be 4 in (100 mm) high and 3 in (75 mm) wide with width of stroke 1/2 in (12 mm) and 1/4 in (6 mm) deep or as large as the available space permits. Furnishing and installation of duct markers is incidental to the respective duct pay item.

110-3.5 BACKFILLING FOR CONDUITS. For conduits, 8 in (200 cm) of sand, soft earth, or other fine fill (loose measurement) shall be placed around the conduits ducts and carefully tamped around and over them with hand tampers. The remaining trench shall then be backfilled and compacted in accordance with Item P-152 "Excavation and Embankment" except that material used for back fill shall be select material not larger than 4 in in diameter.

Trenches shall not contain pools of water during back, filling operations.

The trench shall be completely backfilled and tamped level with the adjacent surface: except that, where sod is to be placed over the trench, the backfilling shall be stopped at a depth equal to the thickness of the sod to be used, with proper allowance for settlement.

Any excess excavated material shall be removed and disposed of in accordance with instructions issued by the Engineer.

110-3.6 BACKFILLING FOR DUCT BANKS. After the concrete has cured, the remaining trench shall be backfilled and compacted in accordance with Item P-152 "Excavation and Embankment" except that the material used for backfill shall be select material not larger than 4 in in diameter. In addition to the requirements of P-152, where duct banks are installed under pavement, one moisture/density test per lift shall be made for each 250 linear feet of duct bank or one work period's construction, whichever is less.

Flowable backfill may alternatively be used.

Trenches shall not contain pools of water during backfilling operations.

The trench shall be completely backfilled and tamped level with the adjacent surface: except that, where sod is to be placed over the trench, the backfilling shall be stopped at a depth equal to the thickness of the sod to be used, with proper allowance for settlement.

Any excess excavated material shall be removed and disposed of in accordance with instructions issued by the Engineer.

110-3.7 RESTORATION. Where sod has been removed, it shall be replaced as soon as possible after the backfilling is completed. All areas disturbed by the work shall be restored to its original condition. The restoration shall include topsoiling, seeding, and mulching shown on the plans. The Contractor shall be held responsible for maintaining all disturbed surfaces and replacements until final acceptance. All restoration shall be considered incidental to the respective L-110 pay item.

METHOD OF MEASUREMENT

110-4.1 Underground conduits and duct banks shall be measured by the linear feet of conduits and duct banks installed, including encasement, locator tape, trenching and backfill with designated, resolution, and reinforcement, all measured in place, completed, and accepted. Separate measurement shall be made for the various types and sizes.

Duct bank markers are to be considered incidental to the pay items in this specification section.

Counterpoise above ductbank measured for payment under another spec section.

BASIS OF PAYMENT

110-5.1 Payment will be made at the contract unit price per linear foot for each type and size of conduit and duct bank completed and accepted, including trench/backfill and restoration with the designated materials, and, for drain lines, the termination at the drainage structure. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item in accordance with the provisions and intent of the plans and specifications.

Payment will be made under:

Item L-110-1	Concrete-Encased Electrical Duct Bank, 1Way-2" Schedule 40 PVC	per Linear Foot
Item L-110-2	Concrete-Encased Electrical Duct Bank, 2Way-4" Schedule 40 PVC	per Linear Foot
Item L-110-3	Electrical Conduit, 2" Schedule 40 PVC, Direct Buried	per Linear Foot

MATERIAL REQUIREMENTS

Fed. Spec. W-C-1094	Conduit and Conduit Fittings; Plastic, Rigid (cancelled; replaced by UL 514 Boxes, Nonmetallic Outlet, Flush Device Boxes, & Covers, and UL 651 Standard for Conduit & Hope Conduit, Type EB & A Rigid PVC)
Underwriters Laboratories Standard 6	Rigid Metal Conduit
Underwriters Laboratories Standard 514B	Fittings for Cable and Conduit
Underwriters Laboratories Standard 1242	Intermediate Metal Conduit
Underwriters Laboratories Standard 651	Schedule 40 and 80 Rigid PVC Conduit (for Direct Burial)
Underwriters Laboratories	Type EB and A Rigid PVC Conduit and HDPE Conduit (for concrete encasement)

Standard 651A

END OF ITEM L-110

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ITEM L-110 A
HORIZONTAL DIRECTIONAL DRILLING

CONTRACT DOCUMENTS

110A-0.1 This item shall consist of installing new underground electrical conduits (single or multiple conduits) installed by trenchless horizontal directional drilling methods in accordance with this specification at the locations and in accordance with the dimensions, designs, and details shown on the plans.

Attention shall be directed to the sections of these specifications entitled, “Summary of Work and Special Work Requirements” and “Supplemental Contract Articles”.

DEFINITIONS

110A-1.1 Horizontal Directional Drilling (HDD): A technique for installing pipes or utility lines below ground using a surface-mounted drill rig that launches and places a pilot drill string in a shallow arc below the surface and has tracking and steering capabilities. Following installation of the pilot string, the pilot bore is enlarged by reaming as required before the new conduit is drawn into place. The HDD operation encompasses each and all of the processes required for installation of the new conduit beneath Runway 12-30 as shown on the drawings and specified here in.

REFERENCES

110A-2.1 The following references form part of this Specification, in case of conflict between the requirements of this Specification and those of the listed documents, the requirements of this Specification shall prevail. The latest edition of the following references shall apply:

ASTM D638 - Standard Test Method for Tensile Properties of Plastic

ASTM D1248 - Polyethylene Plastic Molding and Extrusion Materials

ASTM D3261 - Butt Heat Fusion Polyethylene Plastic Fittings for Polyethylene Plastic Pipe and Tubing

ASTM D3350 - Polyethylene Plastic Pipe and Fittings Material

ASTM F714 - Polyethylene Plastic Pipe Based on Outside Diameter

ASTM F1962 – Standard Guide for Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit Under Obstacles, Including River Crossings.

In the case of a conflict between the requirements of references, the more stringent shall apply.

MATERIALS

110A-3.1 CONDUIT TYPE. Conduit shall meet the following requirements:

- a. shall be smooth wall High Density Polyethylene (HDPE)
- b. shall be UL listed
- c. shall be approved/listed for directional boring
- d. shall be Schedule 80 (minimum)
- e. shall be approved/listed for electrical system installations
- f. shall meet the requirements of ASTM F2160 *Standard Specification for Solid Wall HDPE Conduit Based on Controlled Outside Diameter* (latest edition)
- g. shall meet the requirements of NEMA TC-7 *Smooth-Wall Coilable Electric Polyethylene Conduit*

(Latest edition.)

- h. shall comply with 2008 NEC Article 353 for *High Density Polyethylene Conduit*
- i. shall be manufactured to UL 651 specifications.

Note: HDPE conduit shall always be installed below freeze lines and in no case shall the conduit be installed less than the minimum depths noted in paragraphs 110A-3.2.a, 110A-3.2.b, and 110A-3.2.c.

110A-3.2 CONDUIT SIZE

- a. Minimum size HDPE conduit shall be 5 inches for distribution voltages greater than 1,000 V and less than 34.5 kV (nominal) unless noted otherwise on the drawings.
 - i) Conduit fill shall not exceed 30 percent.
 - ii) Installed HDPE conduit shall have a minimum ground cover of:
 - a) 120 inches in non-pavement-covered areas.
 - b) 48 inches in pavement-covered areas.
 - c) Connections to manholes/handholes shall be as detailed in the contract drawings.
- b. Minimum size HDPE conduit shall be 4 inches for distribution voltages less than 1,000 V unless noted otherwise on the drawings.
 - i) Conduit fill shall not exceed 30 percent.
 - ii) Installed HDPE conduit shall have a minimum ground cover of 48 inches in pavement- or non-pavement-covered areas.
- c. Minimum size HDPE conduit for branch circuit wiring less than 600 V shall be determined by NEC calculation methods for, as a minimum, branch circuit conductor size, maximum allowable pulling tension, and maximum 5 percent voltage drop.
 - i) Conduit fill shall not exceed 40 percent.
 - ii) Installed HDPE conduit shall have a minimum cover of 24 inches in pavement- or non-pavement-covered areas.

CONSTRUCTION METHODS

110A-4.1 GENERAL. This specification does not mandate the use of specific conductor or insulation types for either high- or low-voltage installations. However, the combination of a chosen conductor and insulation type may not meet the requirements for the installation methods required in the following paragraphs where length, depth, and routing of the directional bore conduit may require an alternative conductor material and/or insulation type (i.e., maximum pulling tensions are different for aluminum and copper conductors).

110A-4.2 If the directional bored portion of the cable run is more than 25 percent of the total run length, evaluate and document the conductor derated ampacity in accordance with NFPA 70 Article 310.60 (C) (2).

110A-4.3 Water-jetting is not permitted.

110A-4.4 Pre-installed cable-in-conduit is not permitted.

110A-4.5 Drilling fluids used for HDD methods shall be approved by federal, state, and local codes and authorized for use by the Owner, Engineer and State.

110A-4.6 The conduit(s) shall be installed immediately after the conduit hole is completed.

110A-4.7 There is no restriction on HDD distances provided the allowable pulling tension of the conduit and installed conductors are not exceeded, conductor splices are not within the conduit, and maximum ampacity of conductors due to depth derating is not exceeded.

a. A registered Professional Engineer (P.E.) shall calculate pulling tension requirements for each directional bore, taking into consideration the HDPE conduit(s) size and type, bend radius, elevation changes, vertical and horizontal path deviations, installed electrical conductor size and type, and any conductor ampacity derating due to depth of HDPE conduit.

b. The electrical contractor shall provide certification of compliance with the P.E. directives.

c. The professional engineering design process must include consideration of tensile forces and bend radii created during the installation so that allowable limits are not exceeded.

d. Allowable tensile forces must be determined by a P.E. The P.E. certifying the installation shall account for the conduit's allowable bend radius to prevent ovalization and kinking from installation. Ovalization of the conduit shall not exceed 5 percent.

110A-4.8 HDPE Conduit Terminations.

a. HDPE conduits shall terminate into precast concrete hand holes.

110A-4.9 Joining Methods. Butt and electrofusion joining means are the only joining methods approved for HDPE conduit installations and shall be accomplished by persons certified in the process and in accordance with the manufacturer's procedures.

110A-4.10 Transition from HDPE to PVC. Transition from HDPE to PVC shall be made using only electrofusion coupling means with approved and listed materials. Coupling means shall be accomplished by persons certified on the equipment and process.

a. Coupling between HDPE and concrete-encased duct banks from pavement or non-pavement transitional areas shall be accomplished as indicated on the project plans.

b. Transition from HDPE to concrete manholes from pavement or nonpavement transitional areas shall be accomplished as indicated on the project plans.

METHOD OF MEASUREMENT

110A-5.1 Installation of Conduit via HDD. Underground conduits installed via horizontal directional drilling shall be measured by the linear feet of conduits installed. All conduits shall be measure in place.

BASIS OF PAYMENT

110A-6.1 Installation of Conduit via HDD. Payment will be made at the contract unit price per linear foot of conduit installed by trenchless methods completed and accepted, including mobilization, any required excavation, backfill, restoration, topsoil, seed, and mulch. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item in accordance with the provisions and intent of the plans and specifications.

Payment shall be made under:

Item L-110A-1

Installation of Conduit via HDD

per linear foot

END OF ITEM L-110A

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ITEM L-115
ELECTRICAL HANDHOLES

CONTRACT DOCUMENTS

115-0.1 This section of these specifications is a part of the Contract Documents as defined in the Contract Articles. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other sections.

Attention shall be directed to the sections of these specifications entitled, "Summary of Work and Special Work Requirements" and "Supplemental Contract Articles".

DESCRIPTION

115-1.1 This item shall consist of electrical handholes installed in accordance with this specification, at the indicated locations and conforming to the lines, grades and dimensions shown on the plans or as required by the Engineer. This item shall include the installation of each electrical handhole with all associated excavation, backfilling, sheeting and bracing, concrete, reinforcing steel, ladders, appurtenances, testing, dewatering and restoration of surfaces to the satisfaction of the Engineer.

Attention shall be directed to the sections of these specifications entitled, "Summary of Work and Special Work Requirements" and "Supplemental Contract Articles".

EQUIPMENT AND MATERIALS

115-2.1 GENERAL.

a. All equipment and materials covered by referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when so requested by the Engineer.

b. Manufacturer's certifications shall not relieve the Contractor of the Contractor's responsibility to provide materials in accordance with these specifications and acceptable to the Engineer. Materials supplied and/or installed that do not materially comply with these specifications shall be removed, when directed by the Engineer and replaced with materials, which do comply with these specifications, at the sole cost of the Contractor.

c. All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify pertinent products or models applicable to this project. Indicate all optional equipment and delete non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment for which they apply on each submittal sheet. Markings shall be boldly and clearly made with arrows or circles (highlighting is not acceptable). Contractor is solely responsible for delays in project accruing directly or indirectly from late submissions or resubmissions of submittals.

d. The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications. The Contractor's submittals shall be neatly bound in a properly sized 3-ring binder, tabbed by specification section. The Engineer reserves the right to reject any and all equipment, materials or procedures, which, in the Engineer's opinion, does not meet the system design and the standards and codes, specified herein.

e. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

115-2.2 CONCRETE STRUCTURES. Cast-in-place concrete structures shall conform to the details and dimensions shown on the plans.

Provide precast concrete structures where shown on the plans. Precast concrete structures shall be an approved standard design of the manufacturer. Precast units shall have mortar or Bitumastic sealer placed between all joints to make them watertight. The structure shall be designed to withstand 210,000 lb aircraft loads, unless otherwise shown on the plans. Openings or knockouts shall be provided in the structure as detailed on the plans.

Threaded inserts and pulling eyes shall be cast in as shown.

If the Contractor chooses to propose a different structural design, signed and sealed shop drawings, design calculations, and other information requested by the Engineer shall be submitted by the Contractor to allow for a full evaluation by the Engineer. The Engineer shall review in accordance with the process defined in the General Provisions.

115-2.3 MORTAR. The mortar shall be composed of one part of Portland cement and two parts of mortar sand, by volume. The Portland cement shall conform to the requirements of ASTM C 150, Type I. The sand shall conform to the requirements of ASTM C 144. Hydrated lime may be added to the mixture of sand and cement in an amount not to exceed 15 percent of the weight of cement used. The hydrated lime shall meet the requirements of ASTM C 6. The water shall be clean and free of deleterious amounts of acid, alkalis or organic material. If the water is of questionable quality, it shall be tested in accordance with AASHTO T-26.

115-2.4 CONCRETE. All concrete used in structures shall conform to the requirements of Item P-610, Structural Portland Cement Concrete.

115-2.5 FRAMES AND COVERS. The frames shall conform to one of the following requirements.

- | | | |
|----|---------------------|--|
| a. | ASTM A 48 | Gray iron castings |
| b. | ASTM A 47 | Malleable iron castings |
| c. | ASTM A 27 | Steel castings |
| d. | ASTM A 283, Grade D | Structural steel for grates and frames |
| e. | ASTM A 536 | Ductile iron castings |
| f. | ASTM A 897 | Austempered ductile iron castings |

All castings specified shall withstand a maximum tire pressure of 250 psi and maximum load of 100,000 lb.

All castings or structural steel units shall conform to the dimensions shown on the plans and shall be designed to support the loadings specified.

Each frame and cover unit shall be provided with fastening members to prevent it from being dislodged by traffic, but which will allow easy removal for access to the structure.

All castings shall be thoroughly cleaned. After fabrication, structural steel units shall be galvanized to meet the requirements of ASTM A 123.

Each cover shall have the word "ELECTRIC" or other approved designation cast on it. Each frame and cover shall be as shown on the plans or approved equivalent. No cable notches are required.

115-2.6 REINFORCING STEEL. All reinforcing steel shall be deformed bars of new billet steel meeting the requirements of ASTM A 615, Grade 60.

115-2.7 CABLE TRAYS. Cable trays shall be of galvanized steel, plastic, or aluminum. Cable trays shall be located as shown on the plans.

115-2.8 PLASTIC CONDUIT. Plastic conduit shall comply with Item L-110 - Airport Underground Electrical Duct Banks and Conduits.

115-2.9 CONDUIT TERMINATORS. Conduit terminators shall be pre-manufactured for the specific purpose and sized as required or as shown on the plans.

115-2.10 PULLING-IN IRONS. Pulling-in irons shall be manufactured with 7/8 in (22 mm) diameter hot-dipped galvanized steel or stress-relieved carbon steel roping designed for concrete applications (7 strand, 1/2 in diameter with an ultimate strength of 270,000 psi). Where stress-relieved carbon steel roping is used, a rustproof sleeve shall be installed at the hooking point and all exposed surfaces shall be encapsulated with a polyester coating to prevent corrosion.

115-2.11 GROUND RODS. Ground rods shall be one piece, **copper**. The ground rods shall be of the length and diameter specified on the plans, but in no case shall they be less than 8-feet (240 cm) long nor less than 5/8 in (15 mm) in diameter.

CONSTRUCTION METHODS

115-3.1 UNCLASSIFIED EXCAVATION. It is the Contractor's responsibility to locate existing utilities within the work area prior to excavation. Damage to utility lines, through lack of care in excavating, shall be repaired or replaced to the satisfaction of the Engineer without additional expense to the Owner.

The Contractor shall perform excavation for structures and structure footings to the lines and grades or elevations shown on the plans or as staked by the Engineer. The excavation shall be of sufficient size to permit the placing of the full width and length of the structure or structure footings shown.

All excavation shall be unclassified and shall be considered incidental to the respective L-115 pay item of which it is a component part. Dewatering necessary for L-115 structure installation, erosion and turbidity control, in accordance with Federal, State, and Local requirements is incidental to its respective pay item as a part of Item L-115. The cost of all excavation regardless of type of material encountered, shall be included in the unit price bid for the L-115 Item.

Boulders, logs and all other objectionable material encountered in excavation shall be removed. All rock and other hard foundation material shall be cleaned of all loose material and cut to a firm surface either level, stepped or serrated, as directed by the Engineer. All seams, crevices, disintegrated rock and thin strata shall be removed. When concrete is to rest on a surface other than rock, special care shall be taken not to disturb the bottom of the excavation. Excavation to final grade shall not be made until just before the concrete or reinforcing is to be placed.

The Contractor shall provide all bracing, sheeting and shoring necessary to implement and protect the excavation and the structure as required for safety or conformance to governing laws. The cost of bracing, sheeting and shoring shall be included in the unit price bid for the structure.

Unless otherwise provided, bracing, sheeting and shoring involved in the construction of this item shall be removed by the Contractor after the completion of the structure. Removal shall be effected in a manner that will not disturb or mar finished masonry. The cost of removal shall be included in the unit price bid for the structure.

After each excavation is completed, the Contractor shall notify the Engineer. Structures shall be placed after the Engineer has approved the depth of the excavation and the suitability of the foundation material.

Prior to installation the Contractor shall provide a minimum of 6 in of sand or a material approved by the Engineer as a suitable base to receive the structure. The base material shall be compacted and graded level and at proper elevation to receive the structure in proper relation to the conduit grade or ground cover requirements, as indicated on the plans.

115-3.2 CONCRETE STRUCTURES. Concrete structures shall be built on prepared foundations conforming to the dimensions and form indicated on the plans. The concrete and construction methods shall conform to the requirements specified in Item P-610. Any reinforcement required shall be placed as indicated on the plans and shall be approved by the Engineer before the concrete is placed.

115-3.3 PRECAST UNIT INSTALLATIONS. Precast units shall be installed plumb and true. Joints shall be made watertight by use of sealant at each tongue-and-groove joint and at roof of handhole. Excess sealant shall be removed and severe surface projections on exterior of neck shall be removed.

115-3.4 PLACEMENT AND TREATMENT OF CASTINGS, FRAMES AND FITTINGS. All castings, frames and fittings shall be placed in the positions indicated on the Plans or as directed by the Engineer and shall be set true to line and to correct elevation. If frames or fittings are to be set in concrete or cement mortar, all anchors or bolts

shall be in place and position before the concrete or mortar is placed. The unit shall not be disturbed until the mortar or concrete has set.

Field connections shall be made with bolts, unless indicated otherwise. Welding will not be permitted unless shown otherwise on the approved shop drawings and written permission is granted by the casting manufacturer. Erection equipment shall be suitable and safe for the workman. Errors in shop fabrication or deformation resulting from handling and transportation that prevent the proper assembly and fitting of parts shall be reported immediately to the Engineer and approval of the method of correction shall be obtained. Approved corrections shall be made at Contractor's expense.

Anchor bolts and anchors shall be properly located and built into connection work. Bolts and anchors shall be preset by the use of templates or such other methods as may be required to locate the anchors and anchor bolts accurately.

Pulling-in irons shall be located opposite all conduit entrances into structures to provide a strong, convenient attachment for pulling-in blocks when installing cables. Pulling-in irons shall be set directly into the concrete walls of the structure.

115-3.5 REMOVAL OF SHEETING AND BRACING. In general, all sheeting and bracing used to support the sides of trenches or other open excavations shall be withdrawn as the trenches or other open excavations are being refilled. That portion of the sheeting extending below the top of a structure shall be withdrawn, unless otherwise directed, before more than six (6) in of material is placed above the top of the structure and before any bracing is removed. Voids left by the sheeting shall be carefully refilled with selected material and rammed tight with tools especially adapted for the purpose or otherwise as may be approved.

The Engineer may order the Contractor to delay the removal of sheeting and bracing if, in his judgment, the installed work has not attained the necessary strength to permit placing of backfill.

115-3.6 BACKFILLING. After a structure has been completed, the area around it shall be backfilled in horizontal layers not to exceed 6 in in thickness measured after compaction to the density requirements in Item P-152. Each layer shall be deposited all around the structure to approximately the same elevation. The top of the fill shall meet the elevation shown on the plans or as directed by the Engineer.

Backfill shall not be placed against any structure until permission is given by the Engineer. In the case of concrete, such permission shall not be given until tests made by the laboratory under supervision of the Engineer establish that the concrete has attained sufficient strength to provide a factor of safety against damage or strain in withstanding any pressure created by the backfill or the methods used in placing it.

Where required, the Engineer may direct the Contractor to add, at his own expense, sufficient water during compaction to assure a complete consolidation of the backfill. The Contractor shall be responsible for all damage or injury done to conduits, duct banks, structures, property or persons due to improper placing or compacting of backfill.

115-3.7 CONNECTION OF DUCT BANKS. To relieve stress of joint between concrete-encased duct banks and structure walls, reinforcement rods shall be placed in the structure wall and shall be formed and tied into duct bank reinforcement at the time the duct bank is installed.

115-3.8 GROUNDING. A ground rod shall be installed in the floor of all concrete structures so that the top of rod extends 6 in (154 mm) above the floor. The ground rod shall be installed within 1 ft of a corner of the concrete structure. Ground rods shall be installed prior to casting the bottom slab. Where the soil condition does not permit driving the ground rod into the earth without damage to the ground rod, the Contractor shall drill a 4 in diameter hole into the earth to receive the ground rod. The hole around the ground rod shall be filled throughout its length, below slab, with Portland cement grout. Ground rods shall be installed in precast bottom slab of structures by drilling a hole through bottom slab and installing the ground rod. Bottom slab penetration shall be sealed watertight with Portland cement grout around the ground rod.

A grounding bus of 4/0 bare stranded copper shall be exothermically bonded to the ground rod and loop the concrete structure walls. The ground bus shall be a minimum of 1 ft above the floor of the structure and separate from other cables. No. 2 AWG bare copper pigtailed shall bond the grounding bus to all cable trays and other metal hardware within the concrete structure. Connections to the grounding bus shall be exothermic. Hardware connections may be mechanical, using a lug designed for that purpose.

115-3.9 CLEANUP AND REPAIR. After erection of all galvanized items, damaged areas shall be repaired by applying a liquid cold-galvanizing compound conforming MIL-P-21035. Surfaces shall be prepared and compound applied in accordance with manufacturer's recommendations.

Prior to acceptance, the entire structure shall be cleaned of all dirt and debris.

115-3.10 RESTORATION. After the backfill is completed, the Contractor shall dispose of all surplus material, dirt and rubbish from the site. The Contractor shall restore all disturbed areas equivalent to or better than their original condition. All sodding, grading and restoration shall be considered incidental to the respective L-115 pay item.

The Contractor shall grade around structures as required to provide positive drainage away from the structure.

Areas with special surface treatment, such as roads, sidewalks, or other paved areas shall have backfill compacted to match surrounding areas, and surfaces shall be repaired using materials comparable to original materials.

After all work is completed, the Contractor shall remove all tools and other equipment, leaving the entire site free, clear and in good condition.

115-3.11 INSPECTION. Prior to final approval, the electrical structures shall be thoroughly inspected for conformance with the plans and this specification. Any indication of defects in materials or workmanship shall be further investigated and corrected. The earth resistance to ground of each ground rod shall not exceed 25 ohms. Each ground rod shall be tested using the fall-of-potential ground impedance test as described by ANSI IEEE Standard 81. This test shall be performed prior to establishing connections to other ground electrodes.

115-3.12 DUCT EXTENSION TO EXISTING DUCTS. Where existing concrete encased ducts are to be extended, the duct extension shall be concrete encased plastic conduit. The fittings to connect the ducts together shall be standard manufactured connectors designed and approved for the purpose. The duct extensions shall be installed according to the concrete encased duct detail and as shown on the plans.

METHOD OF MEASUREMENT

115-4.1 Electrical handholes shall be measured by each unit completed in place and accepted. The following additional items are specifically included in each unit.

- All Required Excavation, Dewatering
- Sheeting and Bracing
- All Required Backfilling with On-Site Materials
- Restoration of All Surfaces and Finished Grading, Sodding
- All Required Connections
- Dewatering If Required
- Temporary Cables and Connections
- Ground Rod Testing

BASIS OF PAYMENT

115-5.1 The accepted quantity of electrical handholes will be paid for at the Contract unit price per each, complete and in place. This price shall be full compensation for furnishing all materials and for all preparation, excavation, backfilling and placing of the materials, furnishing and installation of appurtenances and connections to duct banks and other structures as may be required to complete the item as shown on the plans and for all labor, equipment, tools and incidentals necessary to complete the structure.

Payment will be made under:

Item L-115-1	Electrical Handhole, 4' x4' x4'	per Each
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MATERIAL REQUIREMENTS

ANSI/IEEE Std 81	IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System
AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-26	Specification for L-823 Plug and Receptacle Cable Connectors
FED SPEC J-C-30	Cable and Wire, Electrical Power, Fixed Installation (cancelled; replaced by AA-59544 Cable and Wire, Electrical (Power, Fixed Installation))
ASTM B.3	Soft or Annealed Copper Wire
ASTM B.8	Concentric-Lay-Stranded Copper Conductor, Hard, Medium-Hard, or Soft

END OF ITEM L-115

ITEM L-125
INSTALLATION OF AIRPORT LIGHTING SYSTEMS

CONTRACT DOCUMENTS

125-0.1 This section of these specifications is a part of the Contract Documents as defined in the Contract Articles. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other sections.

Attention shall be directed to the sections of these specifications entitled, "Summary of Work and Special Work Requirements" and "Supplemental Contract Articles".

DESCRIPTION

125-1.1 This item shall consist of airport lighting systems furnished and installed in accordance with this specification, the referenced specifications, and the applicable advisory circulars. The systems are installed at the locations and in accordance with the dimensions, design, and details shown in the plans. This item shall include the furnishing of all equipment, materials, services, and incidentals necessary to place the systems in operation as completed units to the satisfaction of the Engineer. The airport lighting systems shall consist of the following work:

- a. Furnishing and installing taxiway edge lighting fixtures as shown on the Drawings.
- b. Furnishing and installing a precision approach path indicator as shown on the Drawings.
- c. Furnishing and installing guidance signs as shown on the Drawings.

Attention shall be directed to the sections of these specifications entitled, "Summary of Work and Special Work Requirements" and "Supplemental Contract Articles".

EQUIPMENT AND MATERIALS

125-2.1 GENERAL.

- a. Airport lighting equipment and materials covered by Federal Aviation Administration (FAA) specifications shall be as approved under the Airport Lighting Equipment Certification Program described in the current version of Appendix 3 to Advisory Circular (AC) 150/5345-53.
- b. Manufacturer's certifications shall not relieve the Contractor of the Contractor's responsibility to provide materials in accordance with these specifications, Appendix 3 to AC 150/5345-53 and as deemed acceptable to the Engineer. Materials supplied and/or installed that do not materially comply with these specifications shall be removed, when directed by the Engineer and replaced with materials, which do comply with these specifications, at the sole cost of the Contractor.
- c. All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify pertinent products or models applicable to this project. Indicate all optional equipment and delete non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment for which they apply on each submittal sheet. Markings shall be boldly and clearly made with arrows or circles (highlighting is not acceptable). Contractor is solely responsible for delays in project accruing directly or indirectly from late submissions or resubmissions of submittals.
- d. The submitted data shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications and AC 150/5345-53. The Contractor's submittals shall be neatly bound in a properly sized 3-ring binder, tabbed by specification section. The Engineer reserves the right to reject any and all equipment, materials or procedures, which, in the Engineer's opinion, does not meet the system design and the standards and codes, specified herein.

- e. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

125-2.2 CONCRETE. Concrete shall conform to Specification Item P610 Structural Portland Cement Concrete.

125-2.3 CONDUIT. Conduit shall conform to Specification Item L-110 Installation of Airport Underground Electrical Duct.

125-2.4 CABLE AND COUNTERPOISE. Cable and Counterpoise shall conform to Item L-108 Installation of Underground Cable for Airports.

125-2.5 TAPE. Rubber electrical tape shall be a self-fusing Ethylene Propylene Rubber (EPR) based high-insulating voltage tape such as Scotch Electrical Tape Number 23 as manufactured by 3M Company or an approved equal.

Plastic vinyl tape shall be 8.5 mil heavy duty, premium grade all-weather vinyl electrical insulating tape such as Scotch Premium Vinyl Electrical Tape 88 as manufactured by 3M Company or an approved equal.

125-2.6 CABLE CONNECTIONS. Cable Connections shall conform to Item L-108 Installation of Underground Cable for Airports.

125-2.7 LIGHT BASE AND TRANSFORMER HOUSINGS. Light Base and Transformer Housings shall conform to the requirements of 150/5345-42 and be listed in appendix 3 to AC 150/5345-53. Light bases shall be Type L-867 or L-868, Class 1A, Size B shall be provided as indicated or as required to accommodate the fixture or device installed thereon. Base plates, cover plates, and adapter plates shall be provided to accommodate various sizes of fixtures.

125-2.8 ISOLATION TRANSFORMERS. Isolation transformers shall be Type L-830, size as required for each installation. Transformer shall conform to AC 150/5345-47 and be listed in appendix 3 to AC 150/5345-53.

125-2.9 SNOW MARKERS. Elevated taxiway edge lights shall have retro-reflective snow markers that extend to a height of 45" above grade. Snow markers are installed via clamp to stake-mounted elevated lights. Snow markers replace one of the bolts in base-mounted elevated lights.

125-2.10 TAXIWAY LIGHTS. Taxiway Edge Lights shall conform to the requirements of 150/5345-46 and be listed in appendix 3 to AC 150/5345-53.

a. Taxiway Elevated Lights.

- (1) L-861T Elevated LED Taxiway Edge Light, 30" height, blue lens, heater, ADB Model #: ETES-1311 or equivalent.

b. Taxiway In-pavement Lights.

- (1) L-852T In-pavement Quartz Taxiway Edge Light, blue lens, halogen lamp, Crouse-Hinds Model #: 21078-P-B-45-NM or equivalent.

c. Lamps and Filters

Lamps shall be of size and type indicated, or as required by fixture manufacturer for each lighting fixture required under this contract.

Filters shall be of colors conforming to the specification for the light concerned or to the standard referenced.

125-2.11 RUNWAY AND TAXIWAY SIGNS.

Runway and Taxiway Signs shall conform to the requirements of 150/5345-44 and be listed in the current version of Appendix 3 to AC 150/5345-53.

- a. L-858Y Direction Sign; Size 1 or 2, Style 2 or 3, Class 2, Mode 2, LED lamps, 1-4 module, 2-face
- b. L-858R Mandatory Sign; Size 1 or 2, Style 2 or 3, Class 2, Mode 2, LED lamps, 1-4 module, 2-face
- c. L-858L Location Sign, Size 1 or 2, Style 2 or 3, Class 2, Mode 2, LED lamps, 1-4 module, 2-face

125-2.12 PRECISION APPROACH PATH INDICATOR

The light units for the PAPI shall meet the requirements of FAA AC 150/5345-28, Type L-881, Style A, Class II, 240V powered, 2-box, with interlock relay, 2-lamp optical box, 3 legs, ADB model #: 44A4733-2121 or equivalent, and be listed in the current version of Appendix 3 to AC 150/5345-53

CONSTRUCTION

125-3.1 SHIPPING AND STORAGE

- a. Equipment should be shipped in suitable packing material to prevent damage during shipping. Equipment and materials should be maintained in new condition and stored in areas protected from weather and physical damage.
- b. Any equipment and materials, in the opinion of the Engineer, damaged during construction or storage shall be replaced by the contractor at no additional cost to the owner. Painted or galvanized surfaces that are damaged shall be repaired according to manufacturer's recommendations.

125-3.2 ELEVATED AND INPAVEMENT LIGHTS

- a. Water, debris, and other foreign substances shall be removed prior to installing light base and light.
- b. A jig or holding device shall be used when installing each light fixture to ensure positioning to the proper elevation, alignment, level control, and azimuth control. Light fixture shall be oriented with the light beams parallel to the runway or taxiway centerline and facing in the required direction. Outermost edge of fixture shall be level with the surrounding pavement. Surplus sealant or flexible embedding material shall be removed. The holding device shall remain in place until sealant has reached its initial set.

125-3.3 GUIDANCE SIGNS

- a. The Contractor shall install the new illuminated sign base with junction box, and transformer housing, cable and all connections according to the details shown on the Plans and conforming to the appropriate project items listed elsewhere in these Specifications.
- b. The Contractor shall install the sign fixture on the concrete foundation so that the sign is plumb, secure and the overall height of the sign is no greater than 30 inches above the surrounding ground for size 1 signs.
- c. Required penetrations through walls of concrete encased transformer housings are considered incidental work to this item and no extra compensation will be paid.
- d. All existing cables associated with the existing guidance signs to be removed shall become the property of the Contractor and shall be legally disposed of off airport property. All turf areas damaged by this work will be backfilled, loamed and seeded at no additional cost to the Owner as directed by the Engineer.
- e. The exact location of all guidance signs will be determined in the field by the Engineer and a Contractor provided survey crew.
- f. Unless otherwise directed by the Engineer, signs shall be oriented so that the face is perpendicular to the taxiway centerline. The orientation of all signs shall be accepted by the Engineer prior to construction.

g. Prior to commencing excavation work for the sign bases, the Contractor shall locate existing utilities and cable raceways in the work area to his satisfaction and as directed by the Engineer. Should the contractor damage any existing utility or cable raceway, he shall repair it immediately to its original working condition in accordance with applicable codes and regulations and as directed by the Engineer. This work shall be considered incidental to the various pay items and no extra compensation will be paid.

125-3.4 GUIDANCE SIGN INSTALLATION

Illuminated and non-illuminated guidance signs shall be installed in accordance with the Contract Drawings. The installation of guidance signs shall follow the 4 steps listed below.

Step 1: Survey Layout, Location of Existing Utilities, and Circuit Verification

The location of the sign is shown on the Contract Drawings. The exact location of the sign shall be determined by the Engineer prior to any guidance sign installation.

Step 2: Installation

New illuminated sign bases shall be constructed and installed in accordance with the guidance sign details on the Contract Drawings. The Contractor shall use extreme caution when excavating to avoid damage to existing utilities. No excavation shall begin prior to completing Step 1 above. The Contractor shall hand dig any conduit trenches in the vicinity of known existing utilities.

Step 3: Erect, wire, splice, and test

The Contractor shall erect the sign, pull cables, splice into the proper circuit, and install panels.

All sign supports shall be erected plumb. Where more than two supports are required, all supports shall be carefully aligned.

Contractor shall cover/mask illuminated signs after installation until such time that all the new signs are installed and have been tested and approved by the Engineer. Once the Contractor receives approval from the engineer for the guidance sign system, then the Contractor shall remove all masks/covers.

The Contractor shall provide his sign installation crew with an accurate voltmeter which is capable of measuring true rms voltage in the range of from 0 to 240 volts AC minimum. He shall also provide the crew with an accurate clamp-on type rms ammeter which is capable of measuring current in a range of from 0 to 10 amperes AC. (It is important that each of these meters be capable of making true rms readings because the current/voltage being measured is not a pure sine wave.)

The Contractor shall furnish his sign installation crew with replacement lamps of the type used in the signs. The Contractor's sign installation crew shall replace any burned out or malfunctioning lamps, whenever they are discovered by the Contractor or at the request of the Engineer.

At the time of connection of the sign to the constant current regulator, the Contractor shall test the operation of the sign and perform the following calibration procedures:

1. Check the wattage and voltage/current rating of the lamps in the sign.
2. After obtaining clearance to do so from the air traffic control tower, energize the sign's circuit to verify that it is wired to the correct circuit and check the sign for malfunctioning lamps. Replace any malfunctioning or burned out lamps.

The Contractor shall compare the current levels for the steps to determine if the sign is operating within the current range as published in the applicable manufacturer's installation instructions. If the sign is not operating within the manufacturer's published range, the Contractor shall adjust the wiring of the sign on the transformer terminal strip, following the manufactures' installation instructions. When the adjustments are made, the Contractor shall record the current levels and submit them to the Engineer for approval.

125-3.5 GUIDANCE SIGN ADJUSTMENTS

Depending on the manufacturer, there may be adjustments that have to be made to the new signs. If adjustments to the voltage or current levels are required, they shall be made after the sign is connected. All voltage and current readings shall be taken with RMS meters. Standard voltage and current meters are not capable of correctly reading the output of the constant current regulator. The Contractor shall be responsible for following direction of the Engineer when adjusting the sign VA. No compensation shall be made for sign adjustments and it shall be considered part of the bid price for the installation of the sign.

125-3.6 REMOVE AND REPLACE EXISTING SIGN PANEL

Where indicated on the contract drawings, the contractor shall remove the existing L-858 sign panels and install new L-858 sign panels meeting the requirements of this specification. The contractor shall ensure fit and compatibility of the new sign panels prior to ordering any materials. The existing sign panels will remain property of the owner.

125-3.7 PRECISION APPROACH PATH INDICATOR

a. General. The installation of the PAPI system shall conform to all applicable provisions of the aforementioned Advisory Circulars unless specified otherwise herein or shown on the Contract Drawings. The Contractor shall furnish and install all materials necessary to install the PAPI system in accordance with these specifications, the details shown on the Contract Drawings, and all referenced Advisory Circulars and Orders. All wiring shall also comply with the latest version of the NEC code as well as any State and Local codes which apply.

The Contractor shall also furnish, install, and connect all specified equipment, equipment accessories, conduit, cables, wires, grounds, and support necessary to ensure a complete and operable system as specified herein and as shown on the plans.

The Contractor shall construct new concrete foundations and gravel bases in accordance with the details shown on the Contract Drawings.

The Contractor shall install new cables as shown on the plans. All power outages shall be coordinated through the Airport Manager. Any unscheduled power outages will not be tolerated.

The elevation of the centerline of the light bar shall be as indicated on the plans. The Contractor shall shorten or extend the legs of the PAPI's as necessary to position the light at the proper elevation.

The Contractor shall furnish and install a ground rod, grounding cable, and ground clamps at each light box foundation as shown on the plans. The ground rods shall be copper-clad steel rods, 3/4" diameter and 10 feet long. The grounding cables shall consist of No. 6 AWG bare solid copper counterpoise and shall be connected to the ground rod by means of exothermic weld and to the base of each unit as shown on the plans using approved ground clamps. Bond all rods together and to #6 counterpoise wire after ground resistance testing is completed. Ground resistance shall be tested and not exceed 25 ohms. If necessary, additional ground rods shall be installed and interconnected to obtain the required resistance.

b. Location of Units. The PAPI light boxes shall be installed at the locations shown on the plans unless otherwise directed or approved by the Engineer and FAA.

c. Foundations. The Contractor shall furnish all labor, equipment, materials, and incidentals and shall construct concrete foundations to the designs and dimensions as shown on the plans for two light boxes including anchor bolts as required to attach the new PAPI to their new foundations. The Concrete shall conform to Project Item "Structural Portland Cement Concrete" of these specifications.

Crushed stone shall be placed around the PAPI foundation to the limits and depths shown on the plans.

d. Installation. The two light boxes and PCA shall be installed on the new concrete foundations as shown on the plans.

e. Electrical Connections. The Contractor shall furnish all materials and labor and shall make all electrical connections required to place the PAPI system in operation. Connections shall be made in accordance with the recommendations of the FAA. Connections within the light boxes shall be made at terminal strips provided therein for the purposes of using connectors as previously specified.

f. Equipment. Check and Aiming. The FAA will perform the flight check.

g. Cables. All cables shall be installed in accordance with section, "L-108 Installation of Underground Cable for Airports" of these specifications unless otherwise noted.

h. Splicing of Shielded Cable. If the shielded cable is to be spliced, prepare cable as for a regular taped splice, except that the neoprene jacket shall be removed a distance not less than 5 inches from the beginning of the penciled portion. Carefully unwrap the shielding tape from that portion where jacket has been removed and cut off so that it extends about 1 inch from the end of the jacket. Proceed with the taped splice as described above and tape up to ¼ inch from the shield on both ends. Build up rubber tape to a thickness equal to the insulation thickness or 5/16 inch over connector.

Next wrap one-half lapped layer of semi-conducting tape (Scotch No. 13 Semi-Conducting Tape or approved equal) over splicing tape and ¼ inch onto the shielding tape. Wrap a fine, flat shielding braid one-half lapped over the splice extending ½ inch onto the metallic shielding. Solder ends braid to metallic shielding tape. A bonding wire, (Minimum No. 14 Standard Copper)(equal to the current carrying capacity of the metallic shield at both ends of the splice. These strands should be tack soldered to the shield in several places. The cable sheath should be replaced by wrapping with two one-half lapped layers of vinyl tape extending 2 inches onto the cable jacket.

This splice is for a straight-through splice with the continuity of shielding.

i. Labels. The Contractor shall securely affix 2" x 2" lettering on the exterior cabinet of the light units. The lettering shall be placed on the exterior side facing the runway. The lettering shall be either black or white in color. The letter shall indicate the light unit identification number on the first row and the final aiming angle as established for that unit on the second row. Example lettering reads as follows:

#1	#2
2 degrees-45'	3 degrees-15'

The Contractor shall securely affix a 6" x 6" weatherproof label on the interior of each light unit and transformer assembly closure or access door to the satisfaction of the Engineer. The label shall include the following information at a minimum:

1. Name of Manufacturer
2. Date of Manufacture
3. Date of Installation
4. Aiming Angle (light units only)
5. A 6" x 3" blank space for future update and maintenance information

The lettering shall be legible to the satisfaction of the FAA and written with permanent, weatherproof, non-smearing type ink acceptable to the Engineer.

j. Inspection and Tests. The Contractor shall inspect and test the completed PAPI installation in accordance with all applicable requirements as outlined in the aforementioned advisory circulars.

METHOD OF MEASUREMENT

125-4.1 Stake-mounted taxiway lights will be measured by the number of each type installed as completed units in place, ready for operation, and accepted by the Engineer. This item shall include the light, stake,

excavations, backfill, L-823 connectors, heat shrink, ground rod, transformer, spare parts, hardware, incidentals, and snow markers.

Base-mounted taxiway lights will be measured by the number of each type installed as completed units in place, ready for operation, and accepted by the Engineer. This item shall include the light, base can, concrete encasement, rapid setting concrete, crack control fabric, black paint, rebar cage, spacer rings, isolation transformer, transformer stand, conduit stubs, excavations, backfill, L-823 connectors, heat shrink, ground rod, spare parts, hardware, incidentals, and snow markers.

Guidance signs will be measured by the number of each type and size installed as completed units, in place, ready for operation, and as accepted by the Engineer. This item shall include the sign, concrete pad, concrete, crack control fabric, black paint, rebar cage, isolation transformer, transformer stand, base junction can, conduit stubs, excavation, backfill, L-823 connectors, heat shrink, ground rod, spare parts, hardware, and incidentals.

Remove and replace existing sign panel be measured by the number of each type and size installed as completed units, in place, ready for operation, and as accepted by the Engineer. This shall include the removal of the existing sign panel, turning the panel over to the owner, furnishing and installing the new panels and all hardware and incidentals.

The Precision Approach Path Indicator system will be measured as a lump sum for all materials, equipment, and labor required to furnish, install, and test an FAA PAPI as inspected and approved by the Engineer. Work and materials include site grading, PAPI foundations (one controller & two light housing units), installation of a PAPI (one controller & two light housing units), conduit and frangible couplings, all cable and conduit from the PCU to the light housing units, all cable and conduit from the PCU to the existing light base for the interlock relay, all grounding, course aggregate, bituminous driveway, and final site preparation. Materials also included are all items not specifically identified herein, but which are required for a complete installation, unless specifically indicated as being included in another pay item. The FAA flight check shall be included in measurement.

BASIS OF PAYMENT

125-5.1 Payment will be made at the Contract unit price for each complete taxiway light, guidance sign, sign panel or precision approach path indicator installed by the Contractor and accepted by the Engineer. This payment will be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools and incidentals necessary to complete this item.

Payment will be made under:

L-125-1	L-861T Taxiway Edge Light, base mounted, infield	per Each
L-125-2	L-861T Taxiway Edge Light, base mounted, existing pavement	per Each
L-125-3	L-861T Taxiway Edge Light, stake mounted	per Each
L-125-4	L-852T Taxiway In-Pavement Omnidirectional Light, base mounted	per Each
L-125-5	L-858 1-Module, Size 1 Guidance Sign	per Each
L-125-6	L-858 2-Module, Size 1 Guidance Sign	per Each
L-125-7	L-858 3-Module, Size 1 Guidance Sign	per Each
L-125-8	L-858 4-Module, Size 1 Guidance Sign	per Each
L-125-9	L-858 1-Module, Size 2 Guidance Sign	per Each
L-125-10	L-858 2-Module, Size 2 Guidance Sign	per Each
L-125-11	L-858 3-Module, Size 2 Guidance Sign	per Each
L-125-12	Remove and Replace Existing Sign Panel	per Each
L-125-13	L-881 Precision Approach Path Indicator	per Each

MATERIAL REQUIREMENTS

AC 150/5345-26 L-823 Plug and Receptacle, Cable Connectors
AC 150/5345-28 Precision Approach Path Indicator (PAPI) Systems
AC 150/5345-42 Airport Light Bases, Transformer Houses, Junction Boxes and Accessories
AC 150/5345-44 Taxiway and Runway Signs
AC 150/5345-46 Runway and Taxiway Light Fixtures
AC 150/5345-47 Isolation Transformers for Airport Lighting Systems

FAA Engineering Brief No. 67

Light Sources other than Incandescent and Xenon for Airport
Lighting and Obstruction Light Fixtures

END OF ITEM L-125

ITEM 16050
ELECTRICAL REQUIREMENTS

CONTRACT DOCUMENTS

16050-0.1 - This section of these specifications is a part of the Contract Documents as defined in the Contract Articles. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other sections.

Attention shall be directed to the sections of these specifications entitled, "Summary of Work and Special Work Requirements" and "Supplemental Contract Articles".

DESCRIPTION

16050-1.1 - This Section shall list scope of electrical work to be performed. Refer to all other sections of this specification for additional scope of work items.

a. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, as specified herein as shown on drawings including but not limited to the following:

- (1) Branch wiring, lighting, poles, cabinets, conduits, and circuit breakers.
- (2) Grounding and bonding of all electrical systems and equipment.
- (3) All wiring, connections and other work necessary to make all electrical components and systems in the project complete and in operating condition.
- (4) Testing of all electrical systems.
- (5) Temporary lighting and power.
- (6) Coordination of work with affected parties.
- (7) All other systems hereinafter specified or indicated on the Contract Drawings, complete, leaving ready an electrical system in perfect operating condition.

16050-1.2 - The requirements of New Hampshire State Building Code and Local regulations established the minimum acceptable quality of workmanship and materials, and all work shall conform thereto unless more stringent requirements are indicated or specified herein.

All work shall comply with the latest editions of the codes as referenced herein.

Follow manufacturer's directions for articles furnished, in addition to directions shown on drawings or specified herein. Protect all work, materials, and equipment from damage during process of work. Replace all damaged or defective work, materials and equipment without additional cost to Owner.

All equipment and materials for permanent installation shall be the products of recognized manufacturers and shall be new.

a. Equipment and materials shall:

- (1) Where normally subject to Underwriters Laboratory Inc. listing or labeling services, be so listed or labeled.
- (2) Be without blemish or defect.

- (3) Not be used for temporary light and power purposes.
- (4) Be in accordance with the latest applicable NEMA standards.
- (5) Be products which will meet with the acceptance of all authorities having jurisdiction over the work. Where such acceptance is contingent upon having the products examined, tested and certified by Underwriters or other recognized testing laboratory, the product shall be so examined, tested and certified.

Except for conduit, conduit fittings, outlet boxes wire and cable, all types of equipment or material of one generic type shall be the product of one manufacturer throughout.

16050-1.3 Reference Standards - Unless otherwise specified or indicated, materials and workmanship and equipment performance shall conform with the latest edition of the following standards, codes, specifications, requirements and regulations:

- a. New Hampshire State Building Code
- b. New Hampshire Electrical Code
- c. National Fire Protection Association (NFPA)
- d. City of Concord Regulations and By-laws
- e. Underwriter's Laboratories, Inc. (UL)
- f. National Electrical Manufacturer's Association (NEMA)
- g. Federal Aviation Administration (FAA)

All electrical work shall meet or exceed any other state and local codes and/or authorities having jurisdiction including all other standards indicated herein.

16050-1.4 Guarantee/Warranty - The Electrical Contractor shall submit manufacturer's warranties for new products as specified in this section. All warranties shall be submitted to the Owner prior to FINAL PAYMENT.

All new materials, items or equipment and workmanship furnished under this section shall carry standard warranty against all defects in material and workmanship for a period of not less than one (1) year from the date of final acceptance of work or as indicated elsewhere in this document. Any fault due to defective or improper material, equipment, workmanship or manufacturing design which may develop within that period shall be made good, forthwith, by and at the expense of this Contractor, including all other damages done to areas, materials and other systems resulting from this failure.

The Contractor shall guarantee that all new elements of the systems meet the specified performance requirements as set forth herein or as indicated on the drawings.

Upon receipt of notice from the Owner of failure of any part of the systems or equipment during the warranty period, the affected part or parts shall be replaced by this Contractor without any reimbursement.

Non-durable items, such as electric lamps, shall be replaced up to the date of acceptance, such that they shall have had no more than 100 hours use prior to this date.

16050-1.5 Interpretation of the Drawings and Specifications - As used in the drawings and specifications for electrical work, certain non-technical words shall be understood to have specific meanings as follows regardless of indications to the contrary in the general conditions or other documents governing the electrical work.

“Furnish”	Purchase and deliver to the project site complete with every necessary appurtenance and support, all as part of the electrical work. Purchasing shall include payment of all sales taxes and other surcharges as may be required to assure that purchased items are free of all liens, claims or encumbrances.
“Install”	Unload at the delivery point at the site and perform every operation necessary to establish secure mounting an correct operation at the proper location in the project, all as part of the electrical work.
“Provide”	“Furnish “ and “Install”.
“New”	Manufactured within the past two years and never before used.

Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any electrical item in the drawings or specifications for electrical work carries with it the instruction to furnish, install and connect the item as part of the electrical work, regardless of whether or not this instruction is explicitly stated.

It shall be understood that the specifications and drawings for electrical work are complimentary and are to be taken together for a complete interpretation of the electrical work except that indications on the drawings, which refer to an individual element of work, take precedence over the specifications where they conflict with same.

To the extent that they govern the basic work, the specifications also govern change order work.

No exclusion from, or limitation in, the symbolism used on the drawings for electrical work or the language used in the specifications for electrical work shall be interpreted as a reason for omitting the appurtenances or accessories necessary to complete any required system or item of equipment.

The drawings for electrical work utilize symbols and schematic diagrams which have no dimensional significance. The work shall, therefore, be installed to fulfill the diagrammatic intent expressed on the electrical drawings, but in conformity with the dimensions indicated on the final working drawings, field layouts and shop drawings of all trades.

Certain details appear on the drawings for electrical work which are specific with regard to the dimensioning and positioning of the work. These are intended only for general information purposes. They do not obviate field coordination for individual items of the indicated work.

Information as to general construction and structural features and finishes shall be derived from structural drawings and specifications only.

The use of words in the singular shall not be considered as limiting where other indications denote that more than one item is referred to.

Ratings of devices, materials and equipment specified without reference to specific performance criteria shall be understood to be nominal or nameplate ratings established by means of industry standard procedures.

16050-1.6 Mounting Heights - Mounting heights of all items shall be as directed by the Resident Engineer and specified herein.

The Contractor shall visit the site to ascertain an appraise himself of the actual field conditions under which the work has to be performed. All work shown on drawings is diagrammatic in nature and their actual locations and

elevation shall be verified in the field. Any deviations necessary as a result of field interferences shall be brought to the attention of the Owner and resolved expeditiously, at no additional cost to the Owner.

All work shall be installed so that parts requiring periodic inspection, operation, maintenance and repair are readily accessible. Minor deviation from the drawings may be made to accomplish this, but changes of substantial magnitude shall not be made prior to written approval from the Owner.

Electrical service characteristics shall be as indicated on the drawing.

All equipment and wiring shall be suitable for the applied voltage.

Prepare maintenance manuals for all electrical and mechanical components. Include the following information for equipment items:

- a. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
- b. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions.
- c. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and re-assembly; aligning and adjusting instructions.
- d. Servicing instructions and lubrication charts and schedules.

EQUIPMENT AND MATERIALS (NOT APPLICABLE)

CONSTRUCTION REQUIREMENTS

16050-2.1 General Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.

Sequence, coordinate, and integrate the various elements of electrical systems, materials, and equipment. Comply with the following requirements:

- a. Coordinate electrical systems, equipment, and materials installation.
- b. Verify all dimensions by field measurements.
- c. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
- d. Sequence, coordinate and integrate installations of electrical materials and equipment for efficient flow of the Work.
- e. Coordinate connection of electrical systems with exterior underground utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
- f. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognized that portions of the Work are shown only in diagrammatic form.

Where coordination requirements conflict with individual system requirements, refer conflict to the Owner.

- g. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other systems and components.
- h. Install electrical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.

METHOD OF MEASUREMENT

“Electrical Requirements” shall not be measured separately for payment but rather, shall be considered incidental to other sections of this specification.

END OF ITEM 16050

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ITEM 16130
CABINETS, BOXES, AND FITTINGS

CONTRACT DOCUMENTS

16130-0.1 - This section of these specifications is a part of the Contract Documents as defined in the Contract Articles. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other sections.

Attention shall be directed to the sections of these specifications entitled, "Summary of Work and Special Work Requirements" and "Supplemental Contract Articles".

DESCRIPTION

16130-1.1 General

Provide labor, materials and equipment necessary to complete the work of this section, including but not limited to the following:

- a. Hinged door enclosures
- b. Fittings

Conduit-body-type electrical enclosures and wiring fittings are specified in Specification Section L-109 "Vault Modifications."

Refer to the following:

- a. Enclosure: A box, case, cabinet, or housing for electrical wiring or components.
- b. Hinged Door Enclosure: An enclosure designed for surface or pole mounting and having swinging doors or covers secured directly to and telescoping with the walls of the box.

16130-1.2 Submittals

Provide product data for enclosures, receptacles, and covers.

Shop fabricated enclosures will not be allowed. All enclosures, receptacles, and covers shall be a regularly manufactured enclosure produced by a company with at least 3 years of experience.

Items provided under this section shall be listed and labeled by UL.

Nationally Recognized Testing Laboratory Listing and Labeling (NRTL): Items provided under this section shall be listed and labeled by a NRTL. The term "NRTL" shall be as defined in OSHA Regulation 1910.7.

Components and installation shall comply with NFPA 70 "National Electrical Code."

Comply with NEMA Standard 250, "enclosures for Electrical Equipment (1000 Volts Maximum)."

EQUIPMENT AND MATERIALS

16130-2.1 Requirements

Subject to compliance with requirements, provide products by the following:

- a. Cabinets:

- (1) Erickson Electrical Equipment Co.
- (2) Hoffman Engineering Co.
- (3) Hennessey Products Inc.
- (4) Spring City Electrical Mfg. Co.
- (5) Square D Co.

The enclosure (s) shall meet or exceed the requirements of a NEMA 4X rating in outdoor locations, stainless steel and shall be U.L. listed.

The cabinet and door (s) shall be constructed from 0.125 inch stainless steel. External welds shall be made by using the Heliarc welding method; whereas, internal welds will be made by the wire welding method. All welds shall be neatly formed and free of cracks, blow holes and other irregularities. All inside and outside edges of the cabinet shall be free of burrs. The cabinet shall be designed with a sloped top to prevent accumulation of water on its top surface. The door opening shall be double flanged on all (4) sides which increase strength around openings and keeps dirt and liquids from entering the enclosure when door is opened. A door restraint shall be provided to prevent door movement in windy conditions.

The cabinet door shall be a minimum of 80% of the front surface area and shall be hinged on the right side when facing the cabinet. The door shall be furnished with a gasket that satisfies the physical properties as found in UL508 table 21.1 and shall form a weathertight seal between the cabinet and door. The hinges shall be continuous and bolted to the cabinet and door utilizing ¼-20 stainless steel carriage bolts and nylock nuts. The hinges shall be made of .093 inch thick aluminum and shall have .250 inch diameter stainless steel hinge pin. The hinge pin shall be capped top and bottom by weld to render it tamperproof. Hinge leaves shall not be exposed externally when the door is closed but hinge knuckles may protrude. The latching mechanism shall be a 3-point draw roller type. Pushrods shall be turned edgewise at the outward supports and shall be .250 inch by .750 inch aluminum, minimum. Rollers shall have a minimum diameter of .875 inch and shall be made of nylon. The center catch shall be fabricated from .187-inch aluminum, minimum. An opening handle shall be furnished. The handle shall be stainless steel with a 0.75-inch diameter shank. The latching handle shall have a provision for a padlocking in the closed position. A light/alarm switch bracket shall be provided.

A switch compartment, with removable back panel, shall be supplied on the enclosure main door. The switch compartment door opening shall be double flanged on all four (4) sides for strength and to prevent liquids or dirt from dropping into the compartment when the door is open. The door shall be furnished with a gasket that satisfies the physical properties as found in UL508 Table 21.1 and shall form a weathertight seal between the cabinet and door. The switch compartment door hinge shall be .063 inch stainless steel with a .120 inch diameter stainless steel hinge pin (hidden hinges).

The enclosures shall be equipped with two (2) adjustable "C" mounting channels on back wall of the enclosure, allowing versatile positioning of panel. The mounting channels shall provide infinite vertical and horizontal adjustment and not limit the positioning of panels. All mounting hardware will be furnished.

The enclosure shall be provided with 5052-H32 aluminum back panel having a thickness of .125 inch. The panel shall have a natural finish. All mounting hardware will be furnished.

Unless otherwise specified, the outside surface of the cabinet shall have a smooth, uniform, natural finish.

Cabinet shall be manufactured by Siemens or an approved U.L. listed equivalent.

CONSTRUCTION REQUIREMENTS

16130-3.1 Requirements

Install items where indicated and where required to suit code requirements and installation conditions.

Cap unused knockout holes where blanks have been removed and plug unused conduit hubs.

Supported and fasten items securely in accordance with the NEC.

Sizes shall be adequate to meet NEC volume requirements, but in no case smaller than sizes indicated.

Removal sharp edges where they may come in contact with wiring or personnel.

Applications shall be as follows:

Hinged Door Enclosures Outdoors: Install drip hood, factory tailored to individual units and door stops.

Mount with fronts straight and plumb.

Electrically ground metallic cabinets, boxes, and enclosures. Where wiring to item includes a grounding conductor, provide a grounding terminal in the interior of the cabinet, box or enclosure.

Upon completion of installation, inspect components. Remove burrs, dirt, and construction debris and repair damaged finish including chips, scratches, abrasions and weld marks.

Install outdoor receptacle assemblies as indicated on the contract drawings..

METHOD OF MEASUREMENT

“Cabinets, Boxes, and Fittings” shall not be measured separately for payment but rather, shall be considered incidental to other sections of this specification.

END OF ITEM 16130

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ITEM 16195
ELECTRICAL IDENTIFICATION

CONTRACT DOCUMENTS

16195-0.1 This section of these specifications is a part of the Contract Documents as defined in the Contract Articles. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other sections.

Attention shall be directed to the sections of these specifications entitled, "Summary of Work and Special Work Requirements" and "Supplemental Contract Articles".

DESCRIPTION

16195-1.1 Provide labor, materials and equipment necessary to complete the work of this section, including but not limited to the following:

- a. Buried cable warnings
- b. Electrical power; control and communication conductor labels.
- c. Operational instructions and warnings.

Manufacturers shall be regularly engaged in manufacture of electrical identification products of types required, whose products have been in satisfactory use in similar services of not less than 3 years.

Installer's shall be at least 3 years of successful installation experience with projects utilizing electrical identification work similar to that required for this project.

Comply with NEC as applicable to installation of identifying labels and markers for wiring and equipment.

Comply with applicable requirements of UL Std 696, "Marking and Labeling Systems", pertaining to electrical identification systems.

Comply with applicable requirements of ANSI Std. A13.1, "Scheme for the Identification of Piping Systems".

Comply with applicable requirements of NEMA Std No's. WC-1 and WC-2 pertaining to identification of power and control conductors.

Manufacturer's data on electrical identification materials and products.

Samples of each color, lettering style and other graphic representation required for each identification material of system.

EQUIPMENT AND MATERIALS

16195-2.1 Subject to compliance with requirements, provide electrical identification products of one of the following (for each type marker):

- a. Alarm Supply Co, Inc.
- b. Brady, W.H. Co.
- c. Calpico Inc.

- d. Cole-Flex Corp.
- e. Direct Safety Co.

Except as otherwise indicated, provide manufacturer's standard products of categories and types required for each application. Where more than single type is specified for an application, selection is Installer's option, but provide single selection for each application.

- a. Standard self-adhesive vinyl tape shall be not less than 3 mils thick by 1-1/2" wide.
 - (1) Colors: Unless otherwise indicated or required by governing regulations, provide orange tape.
- b. Underground-Type Plastic Line Marker
 - (1) Shall be permanent, bright-colored, continuous printed plastic tape, intended for direct-burial service; not less than 6" wide x 4 mils thick. Provide tape with printing which most accurately indicates the type of service of buried cable.
- c. Cable/Conductor Identification Bands
 - (1) Shall be standard aluminum wrap-around cable/conductor markers, of size required for proper application, and numbered to show circuit identification.
 - (2) Shall be standard vinyl-cloth self-adhesive cable/conductor markers of wrap-around type; either pre-numbered plastic coated type, or write -on type with clear plastic self-adhesive cover flap; numbered to show circuit identification.
- d. Plasticized Tags
 - (1) Shall be standard pre-printed or partially pre-printed accident-prevention and operational tags, of plasticized card stock with matt finish suitable for writing, approximately 3 1/4" x 5-5/8", with brass grommets and wire fasteners, and with appropriate pre-printed wording including large-size primary wording, e.g., DANGER, CAUTION, DO NOT OPERATE.
- e. Engraved Plastic-Laminate Signs
 - (1) Provide engraving stock melamine plastic laminate, complying with FS L-P-387, in sizes and thicknesses indicated, engraved with engraver's standard letter style of the sizes and wording indicated, black face and white core plies (letter color) except as otherwise indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.
 - (a) Thickness: 1/16", except as otherwise indicated.
 - (b) Thickness: 1/8", except as otherwise indicated.
 - (c) Thickness: 1/16", for units up to 20 sq. in. or 8" length; 1/8" for larger units.
 - (d) Fasteners: Self-tapping stainless steel screws, except contact type permanent adhesive where screws cannot or should not penetrate the substrate.

Coordinate names, abbreviations and other designations used in electrical identification work, with corresponding designations shown, specified or scheduled. Provide numbers, lettering and wording as indicated or, if not

otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of the electrical systems and equipment. Comply with ANSI A13.1 pertaining to minimum sizes for letters and numbers.

CONSTRUCTION REQUIREMENTS

16195-3.1 General Installation Requirements.

- a. Install electrical identification products as indicated, in accordance with manufacturer's written instructions, and requirements of NEC.
- b. Coordination: Where identification is to be applied to surfaces which require finish, install identification after completion of painting
- c. Regulations: Comply with governing regulations and requests of governing authorities for the identification of electrical work.

During back-filling/topsoiling of each exterior underground electrical, signal or communication cable, install a continuous underground-type plastic line marker, located directly over buried line at 6" to 8" below finished grade. Where multiple small lines are buried in a common trench and do not exceed an overall width of 16", install a single line marker.

- a. Install line marker for every buried cable, regardless of whether direct-buried or protected in conduit.

Apply cable/conductor identification, including voltage, phase and feeder number, on each cable/conductor in each box/enclosure/cabinet where wires of more than one circuit or communication/signal system are present, except where another form of identification (such as color-coded conductors) is provided. Match identification with marking system used in panelboards, shop drawings, contract documents, and similar previously established identification for project's electrical work.

Wherever reasonably required to ensure safe and efficient operation and maintenance of the electrical systems, and electrically connected mechanical systems and general systems and equipment, including the prevention of misuse of electrical facilities by unauthorized personnel, install self-adhesive plastic signs or similar equivalent identification, instruction or warnings on switches, outlets and other controls, devices and covers or electrical enclosures. Where detailed instructions or explanations are needed, provided plasticized tags with clearly written message adequate for the intended purposes.

Install an engraved plastic-laminate sign on each major unit of electrical equipment unless unit is specified with its own self-explanatory identification or signal system. Except as otherwise indicated, provide single line of text, 1/2" high lettering on 1 1/2" high sign (2" high where 2 lines are required), white lettering in black field. Provide text matching terminology and numbering of the contract documents and shop drawings. Provide signs for each unit of the following categories of electrical work:

- a. Panelboards, electrical cabinets and enclosures.
- b. Transformers.

Install signs at locations indicated or, where not otherwise indicated, at location for best convenience of viewing without interference with operation and maintenance of equipment. Secure to substrate with fasteners, except use adhesive where fasteners should not or cannot penetrate substrate. Signs shall indicate device designation, voltage circuit number, and point of main power supply.

METHOD OF MEASUREMENT

“Electrical Identification” shall not be measured separately for payment but rather, shall be considered incidental to other sections of this specification.

END OF ITEM 16195

ITEM 16450
GROUNDING

CONTRACT DOCUMENTS

16450-0.1 General

This section of these specifications is a part of the Contract Documents as defined in the Contract Articles. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other sections.

Attention shall be directed to the sections of these specifications entitled, "Summary of Work and Special Work Requirements" and "Supplemental Contract Articles".

DESCRIPTION

16450-1.1 General

Provided labor, materials and equipment necessary to complete the work of this section, including but not limited to the following:

- a. Solid grounding of all electrical systems.

The extent of electrical grounding and bonding work is indicated by drawings and schedules and as specified herein. Grounding and bonding work is defined to encompass systems, circuits, and equipment.

Applications of electrical grounding and bonding work in this section includes the following:

- a. Underground metal structures.
- b. Grounding electrodes.
- c. Raceways.
- d. Service equipment.
- e. Enclosures.
- f. Equipment.

Refer to other Specification sections herein for wires/cables, electrical raceways, boxes and fittings, and wiring devices which are required in conjunction with electrical grounding and bonding work; not work of this section.

Manufacturer's data on grounding and bonding products and associated accessories.

Manufacturer's shall be regularly engaged in manufacture of grounding and bonding products, of types, and ratings required, and ancillary grounding materials, including stranded cable, copper braid and bus, grounding electrodes and plate electrodes, and bonding jumpers whose products have been in satisfactory use in similar service for not less than 5 years.

Installer's qualifications shall be at least 3 years of successful installation experience on projects with electrical grounding work similar to that required for project.

Comply with applicable local electrical code requirements of the authority having jurisdiction, and NEC as applicable to electrical grounding and bonding, pertaining to systems, circuits and equipment.

Comply with applicable requirements of UL Standards No. 's 467, "Electrical Grounding and Bonding Equipment", and 869 "Electrical Service Equipment", pertaining to grounding and bonding of systems, circuits and equipment.

In addition, comply with UL Std 486A, "Wire Connectors and soldering Lugs for Use with Copper Conductors." Provide grounding and bonding products which are UL listed and labeled for their intended usage.

Comply with applicable requirements and recommended installation practices of IEEE Standards 80, 81, 141 and 142 pertaining to grounding and bonding of systems, circuits and equipment.

EQUIPMENT AND MATERIALS

16450-2.1 Materials

Subject to compliance with requirements, provide grounding and bonding products of one of the following (for each type of product):

- a. Adalet – PLM DIV; Scoot Fetzer Co.
- b. Burndy Corporation
- c. Cadweld Div; Erico Products Inc.
- d. Crouse-Hinds Div; Cooper Industries.
- e. Eagle Electric Mfg Co.
- f. Ideal Industries, Inc.
- g. Joslyn Corporation.
- h. Okonite Company.
- i. OZ Gedney Div; General Signal Corp.
- j. Thomas and Betts Corp.

Except as otherwise indicated, provide electrical grounding and bonding systems indicated; with assembly of materials, including, but not limited to, cables/wires, connectors, solderless lug terminals, grounding electrodes and plate electrodes, bonding jumper braid, and additional accessories needed for a complete installation. Where more than one type component product meets indicated requirements, selection is Installer's option. Where materials or components are not indicated, provide products which comply with NEC, UL and IEEE requirements and with established industry standards for those applications indicated.

Unless otherwise indicated, provide electrical grounding conductors for grounding system connections that match power supply wiring materials and are sized according to NEC.

- a. Copper cable; strand dia. 0.045"; 0.187#/ft.; 57,400 circular mils.
- b. Copper solid strip; 0.051" thick; 1" wide.
- c. Copper solid rod; 0.187#/ft.
- d. Copper cable; strand dia. 0.045"; 14 strands.
- e. Copper solid strip; 0.051" thick; ½" wide.
- f. Copper solid rod; dia. 0.162".
- g. Bonding Jumper Braid: Copper braided tape, constructed of 30-gauge bare copper wires and properly sized for indicated applications.

- h. Flexible Jumper Strap: Flexible flat conductor, 480 strands of 30-gauge bare copper wire; ¾" wide, 9-½" long; 48,250 CM. Select braid with holes sized for 3/8" diameter bolts, and protect braid with copper bolt hole ends.

Ground Electrodes and Plates

- a. Grounding Electrodes: Solid copper, 5/8" dia. by 10 feet.
- b. Electrical Grounding Connection Accessories: Provide electrical insulating tape, heat-shrinkable insulating tubing, welding materials, bonding straps, as recommended by accessories manufacturers for type service indicated.
- c. Field Welding: Comply with AWS Code for procedures, appearance, and quality of welds; and for methods used in correcting welding work. Provide welded connections where grounding conductors connect to underground grounding and plate electrodes.

CONSTRUCTION REQUIREMENTS

16450-3.1 General

Examine areas and conditions under which electrical grounding and bonding connections are to be made and notify Contractor in writing of conditions detrimental to proper completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

Install electrical grounding and bonding systems as indicated, in accordance with manufacturer's instructions and applicable portions of NEC, NECA's "Standard of Installation", and in accordance with recognized industry practices to ensure that products comply with requirements.

Coordinate with other electrical work as necessary to interface installation of electrical grounding and bonding system work with other work.

Weld grounding conductors to underground grounding electrodes.

Connect together system neutral, service equipment enclosures, exposed noncurrent carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables and receptacle ground connectors.

Terminate feeder and branch circuits insulated equipment grounding conductors with grounding lug, bus, or bushing.

Tighten grounding and bonding connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values for connectors and bolts. Where manufacturer's torquing requirements are not indicated, tighten connections to comply with tightening torque values specified in UL 486A to assure permanent and effective grounding.

Route grounding connections and conductors to ground and protective devices in shortest and straightest paths as possible to minimize transient voltage rises.

Apply corrosion-resistant finish to field-connections, buried metallic grounding and bonding products, and places where factory applied protective coatings have been destroyed, which are subjected to corrosive action.

Install clamp-on connectors on clean metal contact surfaces, to ensure electrical conductivity and circuit integrity.

Upon completion of installation of electrical grounding and bonding systems, test ground resistance with ground resistance tester. Where tests show resistance-to-ground is over 25 ohms, take appropriate action to reduce resistance to 25 ohms, or less, by driving additional ground rods; then retest to demonstrate compliance.

METHOD OF MEASUREMENT

“Grounding” shall not be measured separately for payment but rather, shall be considered incidental to other sections of this specification.

END OF ITEM 16450

ITEM 16476
DISCONNECT SWITCHES AND CIRCUIT BREAKERS

CONTRACT DOCUMENTS

16476-0.1 This section of these specifications is a part of the Contract Documents as defined in the Contract Articles. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other sections.

Attention shall be directed to the sections of these specifications entitled, "Summary of Work and Special Work Requirements" and "Supplemental Contract Articles".

DESCRIPTION

16476-1.1 Provide labor, materials and equipment necessary to complete the work of this section, including but not limited to the following:

- a. Molded-case circuit breakers
- b. Disconnect switches

Extent of work is indicated by drawings and schedules.

Refer to other Specification Section E-105 sections for wires/cables and connector work required in conjunction with circuit breaker protective devices; not work of this section.

Provide manufacturer's product data and installation instructions for equipment.

Provide wiring diagrams showing connections to electrical power feeders and associated equipment. Differentiate between portions of wiring which are manufacturer-installed and portions which are field-installed.

Certified test data which indicates current-interrupting ratings for each item.

Manufacturer's shall be regularly engaged in manufacture of circuit breakers, disconnect switches, or panelboards of types, ratings, and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.

Installer's shall be at least 3 years of successful installation experience on projects utilizing circuit-breaker, disconnect switches, or panelboard devices similar to those required for this project.

- a. Codes and Standards
 - (1) Comply with applicable local electrical code requirements of the authority having jurisdiction, and NEC as applicable to construction and installation of circuit breakers.
 - (2) Comply with applicable requirements of UL 486A, 489 and 1066 which apply to construction and installation of circuit.
 - (3) Comply with applicable requirements of NEMA Std's Pub/No.'s AB 1, 2, and 3, SG 3 and 250.
 - (4) Comply with applicable requirements if ANSI/IEEE C37.13, C97.1 pertaining to low-voltage AC power circuit breakers.
 - (5) Comply with Federal Specification W-C-375B/GEN pertaining to molded-case circuit breakers.

Deliver equipment in factory-fabricated type containers or wrappings, which properly protect devices from damage.

Store equipment in original packaging and protect from weather and construction traffic. Wherever possible, store indoors; where necessary to store outdoors, store above grade and enclose with watertight wrapping.

Handle equipment carefully to prevent physical damage to CBs and components. Do not install damaged CBs; remove from site and replace damaged devices with new.

EQUIPMENT AND MATERIALS

16476-2.1 Subject to compliance with requirements, provide equipment by one of the following manufacturers:

- a. Square D Company.
- b. General Electric Co.
- c. Cutler Hammer Corp.

16476-2.2 Molded Case Circuit Breaker

- a. Circuit Breaker: NEMA AB-1. FS W-C 375.
- b. Service Conditions:
 - (1) Temperature: 40 deg C
- c. Configuration: Inverse time automatic tripping. Instantaneous automatic tripping for motor circuit protection.

16476-2.3 Disconnect Switches

- a. Enclosed, Nonfusible Switch: NEMA KS 1, Type HD, with lockable handle.
- b. Enclosure: NEMA, unless otherwise specified or required to meet environmental conditions of installed location. Outdoor Locations: Type 4X.

CONSTRUCTION REQUIREMENTS

16476-3.1 General Requirements

Examine areas and conditions under which equipment are to be installed and notify Contractor in writing of conditions detrimental to proper completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

Install equipment as indicated, in accordance with manufacturer's written instructions and with recognized industry practices to ensure that protective devices comply with requirements. Comply with requirements of NEC, and applicable portions of NEC, and applicable portions of NECA's "Standard of Installation" pertaining to installation of circuit breakers and general wiring practices.

Coordinate with other work, including electrical wiring work, as necessary to interface installation with other work.

Fasten equipment without causing mechanical stresses, twisting or misalignment being exerted by clamps, supports, or cabling.

Set field-adjustable circuit breakers for trip settings as indicated, subsequent to installation of units.

Tighten electrical connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Std 486A.

Inspect operating mechanisms for malfunctioning and, where necessary, clean and adjust units for free mechanical movement.

Provide equipment grounding connections for circuit breakers as indicated. Tighten connectors to comply with tightening torques specified in UL Std 486A to assure permanent and effective grounding.

Upon completion of installation and after circuitry has been energized, demonstrate capability and compliance of system with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting. Testing and retesting at no cost to Owner.

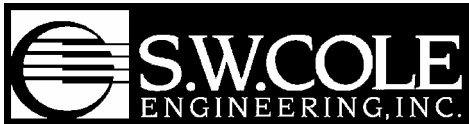
METHOD OF MEASUREMENT

"Disconnect Switches and Circuit Breakers" shall not be measured separately for payment but rather, shall be considered incidental to other sections of this specification.

END OF ITEM 16476

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GEOTECHNICAL REPORT



BORING LOG

PROJECT / CLIENT: PROPOSED NEW TAXIWAY B / JACOBS ENGINEERING GROUP, INC.
LOCATION: CONCORD MUNICIPAL AIRPORT - CONCORD, NEW HAMPSHIRE
DRILLING CO.: GREAT WORKS TEST BORING, INC. DRILLER: WILL AIKMAN

BORING NO.: B-1
SHEET: 1 OF 1
PROJECT NO.: 11-0152
DATE START: 3/7/2012
DATE FINISH: 3/7/2012
ELEVATION: NOT AVAILABLE
SWC REP.: NMC

CASING: TYPE HSA SIZE I.D. 2 1/4" HAMMER WT. HAMMER FALL
SAMPLER: SS 1 3/8" 140 lbs 30"
CORE BARREL:

WATER LEVEL INFORMATION
NO FREE WATER OBSERVED

CASING BLOWS PER FOOT	SAMPLE				SAMPLER BLOWS PER 6"				DEPTH	STRATA & TEST DATA
	NO.	PEN.	REC.	DEPTH @ BOT	0-6	6-12	12-18	18-24		
	1D	24"	20"	2.0'	8	6	6	8	1.5'	GRASS AND DARK BROWN SILTY SAND TRACE ORGANICS
	2D	2"	24"	4.0'	5	8	8	7	6.0'	BROWN SAND TRACE SILT AND GRAVEL (SP) ~MEDIUM DENSE~ EST. CBR = 10 w = 2.7%
	3D	24"	16"	6.0'	5	5	5	5		BROWN SILTY FINE SAND (SP) ~MEDIUM DENSE~
	4D	24"	14"	8.0'	8	6	7	7		
	5D	24"	15"	10.0'	4	4	5	6	12.0'	BROWN SAND TRACE SILT AND GRAVEL (SP) ~MEDIUM DENSE~
	6D	24"	14"	12.0'	7	5	5	7		BOTTOM OF EXPLORATION AT 12.0'

SAMPLES:
D = SPLIT SPOON
C = 2" SHELBY TUBE
S = 3" SHELBY TUBE
U = 3.5" SHELBY TUBE

SOIL CLASSIFIED BY:

X
X

DRILLER - VISUALLY
SOIL TECH. - VISUALLY
LABORATORY TEST

REMARKS:

STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL.

BORING NO.: B-1

2

BORING NO.: **B-2**



BORING LOG

PROJECT / CLIENT: PROPOSED NEW TAXIWAY B / JACOBS ENGINEERING GROUP, INC.
LOCATION: CONCORD MUNICIPAL AIRPORT - CONCORD, NEW HAMPSHIRE
DRILLING CO.: GREAT WORKS TEST BORING, INC. DRILLER: WILL AIKMAN

BORING NO.: B-3
SHEET: 1 OF 1
PROJECT NO.: 11-0152
DATE START: 3/7/2012
DATE FINISH: 3/7/2012
ELEVATION: NOT AVAILABLE
SWC REP.: NMC

CASING: TYPE HSA SIZE I.D. 2 1/4" HAMMER WT. HAMMER FALL
SAMPLER: SS 1 3/8" 140 lbs 30"
CORE BARREL:

WATER LEVEL INFORMATION
NO FREE WATER OBSERVED

CASING BLOWS PER FOOT	SAMPLE				SAMPLER BLOWS PER 6"				DEPTH	STRATA & TEST DATA
	NO.	PEN.	REC.	DEPTH @ BOT	0-6	6-12	12-18	18-24		
										DARK BROWN SILTY SAND TRACE ORGANICS
	1D	24"	15"	2.0'	11	7	9	4	1.5'	
	2D	24"	12"	4.0'	4	4	4	4	4.0'	BROWN SAND SOME SILT (SP-SM) ~LOOSE~ EST. CBR = 15
	3D	24"	16"	6.0'	4	3	5	6		w = 3.6% BROWN SAND TRACE GRAVEL AND SILT (SP) ~MEDIUM DENSE~
	4D	24"	15"	8.0'	8	7	7	7		
	5D	24"	18"	10.0'	4	5	5	6		
	6D	24"	18"	12.0'	5	5	6	5	12.0'	
										BOTTOM OF EXPLORATION AT 12.0'

SAMPLES: D = SPLIT SPOON
C = 2" SHELBY TUBE
S = 3" SHELBY TUBE
U = 3.5" SHELBY TUBE

SOIL CLASSIFIED BY:

	DRILLER - VISUALLY
X	SOIL TECH. - VISUALLY
X	LABORATORY TEST

REMARKS:

STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL.

BORING NO.: B-3

4

BORING NO.: B-4

BORING NO.: **B-5**



BORING NO.:	B-8
SHEET:	1 OF 1
PROJECT NO.:	11-0152
DATE START:	3/7/2012
DATE FINISH:	3/7/2012
ELEVATION:	NOT AVAILABLE
SWC REP.:	NMC

WATER LEVEL INFORMATION
NO FREE WATER OBSERVED

SAMPLES:	SOIL CLASSIFIED BY:	
D = SPLIT SPOON		
C = 2" SHELBY TUBE		DRILLER - VISUALLY
S = 3" SHELBY TUBE	X	SOIL TECH. - VISUALLY
U = 3.5" SHELBY TUBE	X	LABORATORY TEST

REMARKS:

STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL.



BORING LOG

PROJECT / CLIENT: PROPOSED NEW TAXIWAY B / JACOBS ENGINEERING GROUP, INC.
LOCATION: CONCORD MUNICIPAL AIRPORT - CONCORD, NEW HAMPSHIRE
DRILLING CO.: GREAT WORKS TEST BORING, INC. DRILLER: WILL AIKMAN

BORING NO.: B-10
SHEET: 1 OF 1
PROJECT NO.: 11-0152
DATE START: 3/8/2012
DATE FINISH: 3/8/2012
ELEVATION: NOT AVAILABLE
SWC REP.: NMC

CASING: TYPE HSA SIZE I.D. 2 1/4" HAMMER WT. HAMMER FALL
SAMPLER: SS 1 3/8" 140 lbs 30"
CORE BARREL:

WATER LEVEL INFORMATION
NO FREEWATER OBSERVED

CASING BLOWS PER FOOT	SAMPLE				SAMPLER BLOWS PER 6"				DEPTH	STRATA & TEST DATA
	NO.	PEN.	REC.	DEPTH @ BOT	0-6	6-12	12-18	18-24		
	1D	24"	18"	2.0'	14	12	9	10	1.4'	DARK BROWN SILTY SAND TRACE ORGANICS
	2D	24"	20"	4.0'	8	7	7	10		w = 2.9% EST. CBR = 10 BROWN SAND TRACE SILT AND GRAVEL (SP) ~MEDIUM DENSE~
	3D	24"	16"	7.0'	4	6	8	9		
									10.0'	
	4D	24"	22"	12.0'	4	6	6	8	12.0'	BROWN SILTY FINE SAND (SM) ~MEDIUM DENSE~
										BOTTOM OF EXPLORATION AT 12.0'

SAMPLES: D = SPLIT SPOON
C = 2" SHELBY TUBE
S = 3" SHELBY TUBE
U = 3.5" SHELBY TUBE

SOIL CLASSIFIED BY:

	DRILLER - VISUALLY
X	SOIL TECH. - VISUALLY
X	LABORATORY TEST

REMARKS:

STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL.

BORING NO.: B-10

11



BORING LOG

PROJECT / CLIENT: PROPOSED NEW TAXIWAY B / JACOBS ENGINEERING GROUP, INC.
LOCATION: CONCORD MUNICIPAL AIRPORT - CONCORD, NEW HAMPSHIRE
DRILLING CO.: GREAT WORKS TEST BORING, INC. DRILLER: WILL AIKMAN

BORING NO.: B-11
SHEET: 1 OF 1
PROJECT NO.: 11-0152
DATE START: 3/8/2012
DATE FINISH: 3/8/2012
ELEVATION: NOT AVAILABLE
SWC REP.: NMC

CASING: TYPE HSA SIZE I.D. 2 1/4" HAMMER WT. HAMMER FALL
SAMPLER: SS 1 3/8" 140 lbs 30"
CORE BARREL:

WATER LEVEL INFORMATION
NO FREEWATER OBSERVED

CASING BLOWS PER FOOT	SAMPLE				SAMPLER BLOWS PER 6"				DEPTH	STRATA & TEST DATA
	NO.	PEN.	REC.	DEPTH @ BOT	0-6	6-12	12-18	18-24		
	1D	24"	20"	2.0'	14	14	11	11	1.8'	DARK BROWN SILTY SAND TRACE ORGANICS
	2D	24"	15"	4.0'	8	7	7	7	8.0'	EST. CBR = 10 BROWN SAND TRACE SILT AND GRAVEL (SP) ~MEDIUM DENSE~
	3D	24"	18"	6.0'	4	7	7	8		
	4D	24"	20"	8.0'	7	7	7	7		
	5D	24"	18"	10.0'	7	6	5	5	14.0'	BROWN SAND SOME SILT (SP-SM) ~LOOSE~
	6D	24"	16"	12.0'	2	2	3	3		
	7D	24"	20"	14.0'	3	3	3	3		
	8D	24"	22"	16.0'	5	5	5	5	16.0'	LIGHT BROWN SAND SOME SILT (SP-SM) ~MEDIUM DENSE~
	9D	24"	20"	18.0'	6	7	8	10	18.0'	LIGHT BROWN SAND TRACE SILT AND GRAVEL (SP) w = 4.7% ~MEDIUM DENSE~
	10D	24"	20"	20.0'	9	9	10	9	22.0'	LIGHT BROWN SILTY FINE SAND (SM) ~MEDIUM DENSE~
	11D	24"	21"	22.0'	9	9	10	10		
									BOTTOM OF EXPLORATION AT 22.0'	

SAMPLES: D = SPLIT SPOON
C = 2" SHELBY TUBE
S = 3" SHELBY TUBE
U = 3.5" SHELBY TUBE

SOIL CLASSIFIED BY:

	DRILLER - VISUALLY
X	SOIL TECH. - VISUALLY
X	LABORATORY TEST

REMARKS:

STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL.

BORING NO.: B-11

12



BORING LOG

PROJECT / CLIENT: PROPOSED NEW TAXIWAY B / JACOBS ENGINEERING GROUP, INC.
LOCATION: CONCORD MUNICIPAL AIRPORT - CONCORD, NEW HAMPSHIRE
DRILLING CO.: GREAT WORKS TEST BORING, INC. DRILLER: WILL AIKMAN

BORING NO.: B-12
SHEET: 1 OF 1
PROJECT NO.: 11-0152
DATE START: 3/8/2012
DATE FINISH: 3/8/2012
ELEVATION: NOT AVAILABLE
SWC REP.: NMC

CASING: TYPE HSA SIZE I.D. 2 1/4" HAMMER WT. HAMMER FALL
SAMPLER: SS 1 3/8" 140 lbs 30"
CORE BARREL:

WATER LEVEL INFORMATION
NO FREEWATER OBSERVED

CASING BLOWS PER FOOT	SAMPLE				SAMPLER BLOWS PER 6"				DEPTH	STRATA & TEST DATA
	NO.	PEN.	REC.	DEPTH @ BOT	0-6	6-12	12-18	18-24		
									1.0'	DARK BROWN SILTY SAND TRACE ORGANICS
	1D	24"	19"	2.0'	9	7	5	5	5.0'	BROWN SILTY SAND TRACE GRAVEL (SM) ~MEDIUM DENSE~ EST. CBR = 15
	2D	24"	20"	4.0'	4	5	5	5		
	3D	24"	14"	7.0'	5	6	9	9	10.0'	BROWN SAND TRACE SILT (SP) ~MEDIUM DENSE~
	4D	24"	16"	12.0'	5	9	8	8	15.0'	LIGHT BROWN SAND SOME SILT (SP) w = 8.1% ~MEDIUM DENSE~
	5D	24"	22"	17.0'	7	8	10	9	20.0'	BROWN SAND SOME SILT (SP-SM) ~MEDIUM DENSE~
	6D	24"	18"	22.0'	15	15	12	15	22.0'	ORANGE - LIGHT BROWN SILT AND FINE SAND AND STRATIFIED (ML) ~MEDIUM DENSE~
									22.0'	BOTTOM OF EXPLORATION AT 22.0'

SAMPLES: SOIL CLASSIFIED BY:
D = SPLIT SPOON
C = 2" SHELBY TUBE
S = 3" SHELBY TUBE
U = 3.5" SHELBY TUBE

	DRILLER - VISUALLY
X	SOIL TECH. - VISUALLY
X	LABORATORY TEST

REMARKS:
STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL.

14

16



BORING LOG

PROJECT / CLIENT: PROPOSED NEW TAXIWAY B / JACOBS ENGINEERING GROUP, INC.
LOCATION: CONCORD MUNICIPAL AIRPORT - CONCORD, NEW HAMPSHIRE
DRILLING CO.: GREAT WORKS TEST BORING, INC. DRILLER: WILL AIKMAN

BORING NO.: B-18
SHEET: 1 OF 1
PROJECT NO.: 11-0152
DATE START: 3/8/2012
DATE FINISH: 3/8/2012
ELEVATION: NOT AVAILABLE
SWC REP.: NMC

CASING: TYPE HSA SIZE I.D. 2 1/4" HAMMER WT. HAMMER FALL
SAMPLER: SS 1 3/8" 140 lbs 30"
CORE BARREL:

WATER LEVEL INFORMATION
NO FREEWATER OBSERVED

CASING BLOWS PER FOOT	SAMPLE				SAMPLER BLOWS PER 6"				DEPTH	STRATA & TEST DATA
	NO.	PEN.	REC.	DEPTH @ BOT	0-6	6-12	12-18	18-24		
	1D	24"	19"	2.0'	14	20	18	16	1.5'	DARK BROWN SILTY SAND TRACE ORGANICS
	2D	24"	18"	4.0'	7	8	8	9		w = 3.2% EST. CBR = 15 ORANGE - BROWN SAND TRACE SILT (SP) ~MEDIUM DENSE~
	3D	24"	14"	7.0'	2	3	5	6		
									10.0'	
	4D	24"	16"	12.0'	5	5	6	5	12.0'	BROWN SILTY FINE SAND (SM) ~MEDIUM DENSE~
										BOTTOM OF EXPLORATION AT 12.0'

SAMPLES: SOIL CLASSIFIED BY:
D = SPLIT SPOON
C = 2" SHELBY TUBE
S = 3" SHELBY TUBE
U = 3.5" SHELBY TUBE

	DRILLER - VISUALLY
X	SOIL TECH. - VISUALLY
X	LABORATORY TEST

REMARKS:
STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL.

19

BORING NO.: B-18

KEY TO THE NOTES & SYMBOLS

Test Boring and Test Pit Explorations

All stratification lines represent the approximate boundary between soil types and the transition may be gradual.

Key to Symbols Used:

w	-	water content, percent (dry weight basis)
q _u	-	unconfined compressive strength, kips/sq. ft. - based on laboratory unconfined compressive test
S _v	-	field vane shear strength, kips/sq. ft.
L _v	-	lab vane shear strength, kips/sq. ft.
q _p	-	unconfined compressive strength, kips/sq. ft. based on pocket penetrometer test
O	-	organic content, percent (dry weight basis)
W _L	-	liquid limit - Atterberg test
W _p	-	plastic limit - Atterberg test
WOH	-	advance by weight of hammer
WOM	-	advance by weight of man
WOR	-	advance by weight of rods
HYD	-	advance by force of hydraulic piston on drill
RQD	-	Rock Quality Designator - an index of the quality of a rock mass. RQD is computed from recovered core samples.
γ _T	-	total soil weight
γ _B	-	buoyant soil weight

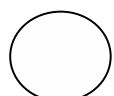
Description of Proportions:

0 to 5% TRACE
5 to 12% SOME
12 to 35% "Y"
35+% AND

REFUSAL: Test Boring Explorations - Refusal depth indicates that depth at which, in the drill foreman's opinion, sufficient resistance to the advance of the casing, auger, probe rod or sampler was encountered to render further advance impossible or impracticable by the procedures and equipment being used.

REFUSAL: Test Pit Explorations - Refusal depth indicates that depth at which sufficient resistance to the advance of the backhoe bucket was encountered to render further advance impossible or impracticable by the procedures and equipment being used.

Although refusal may indicate the encountering of the bedrock surface, it may indicate the striking of large cobbles, boulders, very dense or cemented soil, or other buried natural or man-made objects or it may indicate the encountering of a harder zone after penetrating a considerable depth through a weathered or disintegrated zone of the bedrock.





Report of Hydrometer

ASTM D-422

Project Name Concord Municipal Airport
 Client Jacobs Engineering Group, Inc.
 Material Type Coarse to Fine Sand Trace Silt and Gravel
 Material Source Concord Municipal Airport
 Exploration B-1, 3D, 4.0' - 6.0'

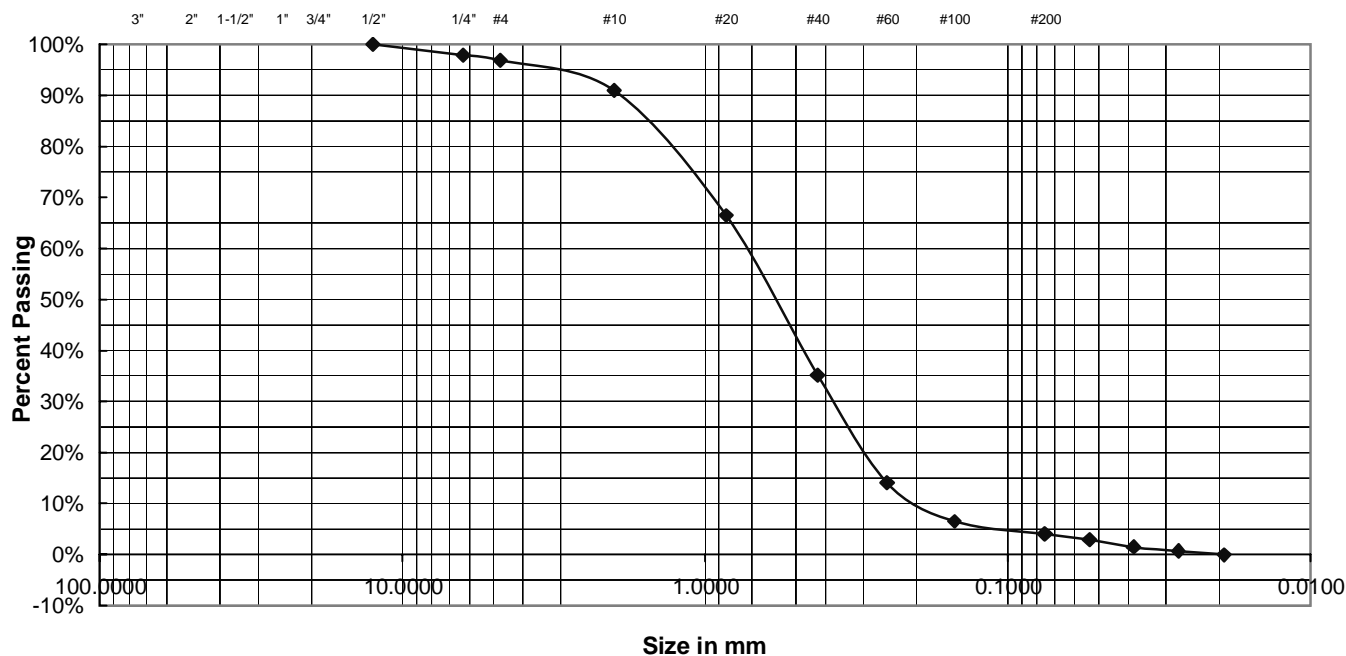
Project Number 11-0152
 Lab ID 9444S
 Date Received 3/9/2012
 Date Completed 3/16/2012
 Tested By JJR

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)
3"	75	100
2"	50	100
1-1/2"	37.5	100
1"	25	100
3/4"	19	100
1/2"	12.5	100
1/4"	6.3	98
No. 4	4.75	97
No. 10	2	91
No. 20	0.85	66
No. 40	0.425	35
No. 60	0.25	14
No. 100	0.15	6
No. 200	0.075	4.1

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.076	4.1
0.054	2.9
0.027	0.7
0.019	0.0



Particle Distribution

Gravel, retained on #4	3.1%
Sand, passing #4 and retained on #200	92.8%
Fines, 0.074 to 0.005	4.1%
Clay Fraction, <0.005	0.0%

Comments: Moisture Content = 2.7%

Chad B. Michaud

Reviewed By



Report of Hydrometer

ASTM D-422

Project Name Concord Municipal Airport
 Client Jacobs Engineering Group, Inc.
 Material Type Medium to Fine Sand Trace Silt and Gravel
 Material Source Concord Municipal Airport
 Exploration B-2, 2D, 2.0' - 4.0'

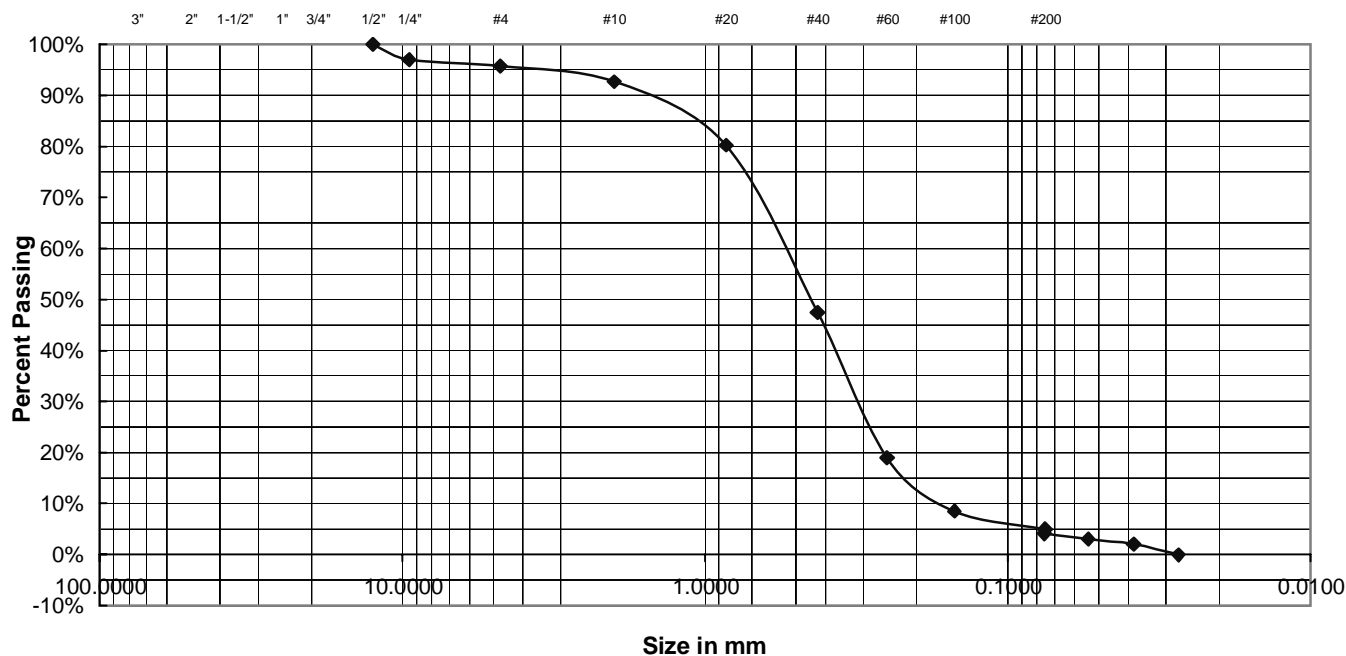
Project Number 11-0152
 Lab ID 9445S
 Date Received 3/9/2012
 Date Completed 3/15/2012
 Tested By MJS

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)
3"	75	100
2"	50	100
1-1/2"	37.5	100
1"	25	100
3/4"	19	100
1/2"	12.5	100
3/8"	9.5	97
No. 4	4.75	96
No. 10	2	93
No. 20	0.85	80
No. 40	0.425	47
No. 60	0.25	19
No. 100	0.15	9
No. 200	0.075	5.0

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.076	4.1
0.054	3.1
0.027	0.0



Particle Distribution

Gravel, retained on #4	4.3%
Sand, passing #4 and retained on #200	90.8%
Fines, 0.074 to 0.005	4.9%
Clay Fraction, <0.005	0.0%

Comments: Moisture Content = 5.7%

Chad B. Michaud

Reviewed By



Report of Hydrometer

ASTM D-422

Project Name Concord Municipal Airport
 Client Jacobs Engineering Group, Inc.
 Material Type Coarse to Fine Sand Trace Gravel and Silt
 Material Source Concord Municipal Airport
 Exploration B-3, 3D, 4.0' - 6.0'

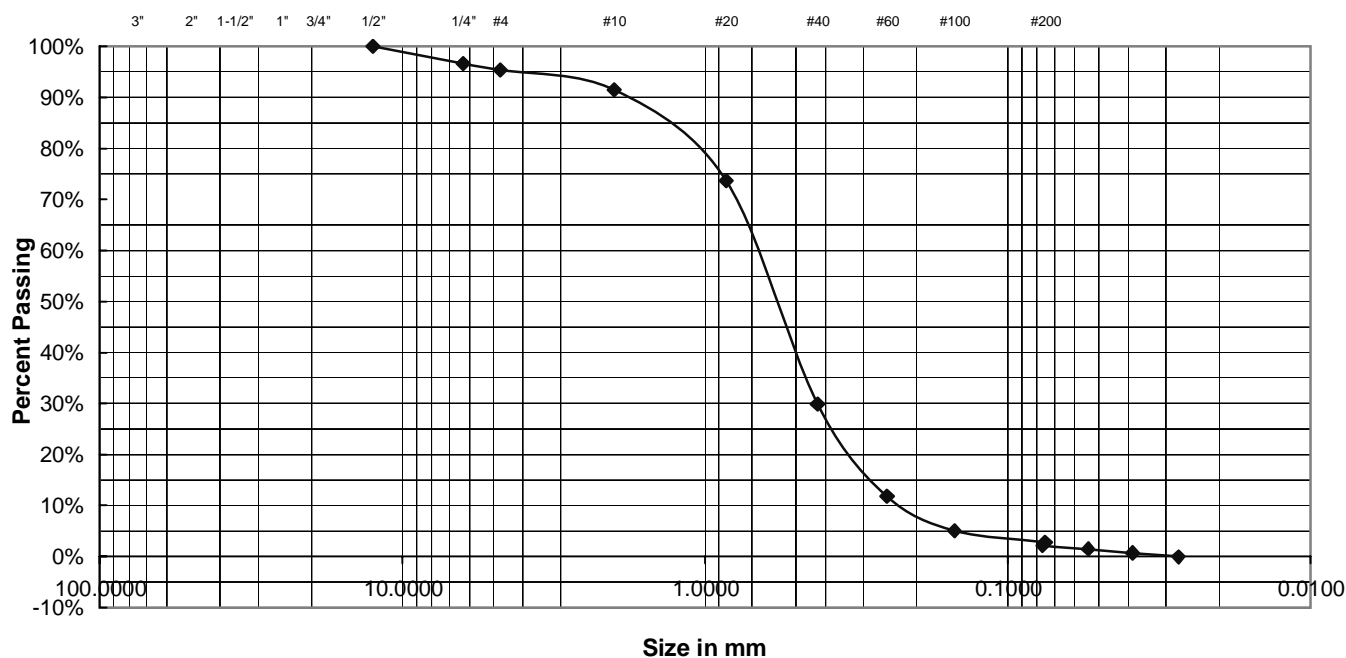
Project Number 11-0152
 Lab ID 9446S
 Date Received 3/9/2012
 Date Completed 3/16/2012
 Tested By JJR

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)
3"	75	100
2"	50	100
1-1/2"	37.5	100
1"	25	100
3/4"	19	100
1/2"	12.5	100
1/4"	6.3	97
No. 4	4.75	95
No. 10	2	91
No. 20	0.85	74
No. 40	0.425	30
No. 60	0.25	12
No. 100	0.15	5
No. 200	0.075	2.8

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.077	2.2
0.054	1.5
0.027	0.0



Particle Distribution

Gravel, retained on #4	4.6%
Sand, passing #4 and retained on #200	92.6%
Fines, 0.074 to 0.005	2.8%
Clay Fraction, <0.005	0.0%

Comments: Moisture Content = 3.6%

Chad B. Michaud

Reviewed By



Report of Hydrometer

ASTM D-422

Project Name Concord Municipal Airport
 Client Jacobs Engineering Group, Inc.
 Material Type Coarse to Fine Sand Trace Gravel and Silt
 Material Source Concord Municipal Airport
 Exploration B-4, 2D, 2.0' - 4.0'

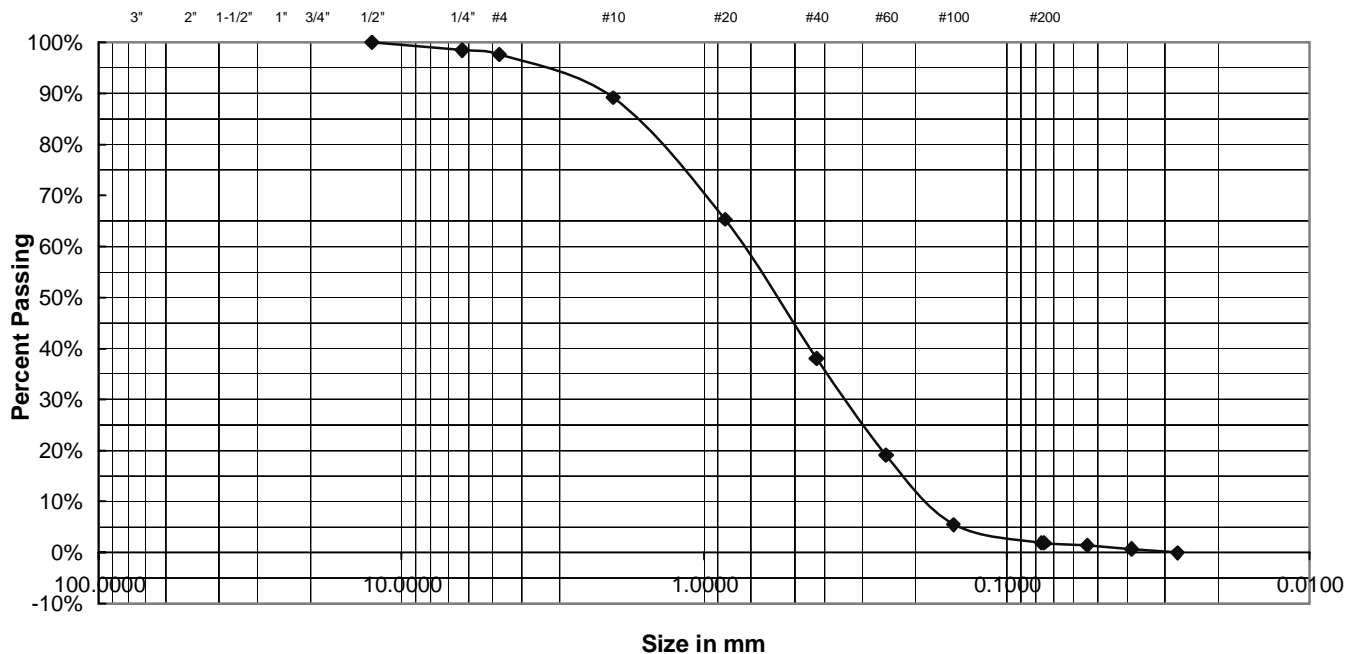
Project Number 11-0152
 Lab ID 9447S
 Date Received 3/9/2012
 Date Completed 3/16/2012
 Tested By JJR

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)
3"	75	100
2"	50	100
1-1/2"	37.5	100
1"	25	100
3/4"	19	100
1/2"	12.5	100
1/4"	6.3	98
No. 4	4.75	98
No. 10	2	89
No. 20	0.85	65
No. 40	0.425	38
No. 60	0.25	19
No. 100	0.15	5
No. 200	0.075	1.9

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.077	1.8
0.054	1.4
0.027	0.0



Particle Distribution

Gravel, retained on #4	2.4%
Sand, passing #4 and retained on #200	95.8%
Fines, 0.074 to 0.005	1.9%
Clay Fraction, <0.005	0.0%

Comments: Moisture Content = 2.9%

Chad B. Michaud

Reviewed By



Report of Hydrometer

ASTM D-422

Project Name Concord Municipal Airport
 Client Jacobs Engineering Group, Inc.
 Material Type Coarse to Fine Sand Some Gravel Trace Silt
 Material Source Concord Municipal Airport
 Exploration B-5, 3D, 4.0 - 6.0'

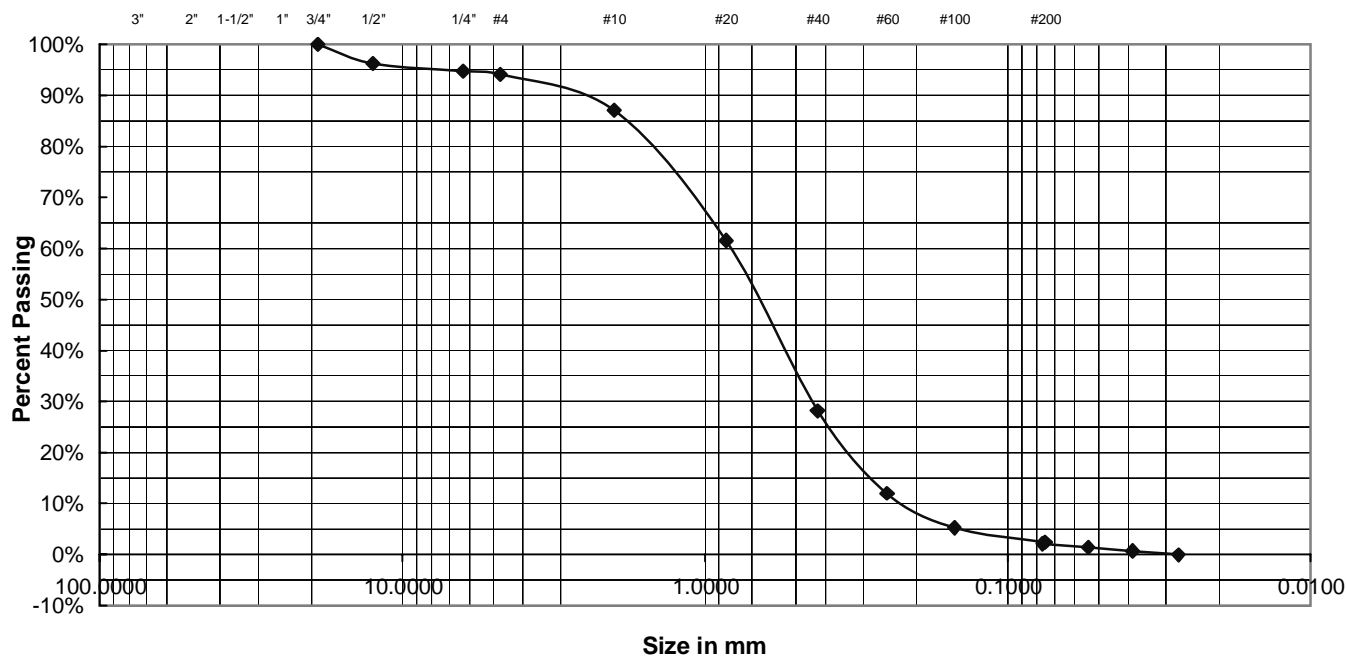
Project Number 11-0152
 Lab ID 9448S
 Date Received 3/9/2012
 Date Completed 3/16/2012
 Tested By JJR

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)
3"	75	100
2"	50	100
1-1/2"	37.5	100
1"	25	100
3/4"	19	100
1/2"	12.5	96
1/4"	6.3	95
No. 4	4.75	94
No. 10	2	87
No. 20	0.85	62
No. 40	0.425	28
No. 60	0.25	12
No. 100	0.15	5
No. 200	0.075	2.4

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.077	2.1
0.054	1.4
0.027	0.0



Particle Distribution

Gravel, retained on #4	5.9%
Sand, passing #4 and retained on #200	91.7%
Fines, 0.074 to 0.005	2.4%
Clay Fraction, <0.005	0.0%

Comments: Moisture Content = 3.8%

Chad B. Michaud

Reviewed By



Report of Hydrometer

ASTM D-422

Project Name Concord Municipal Airport
 Client Jacobs Engineering Group, Inc.
 Material Type Medium to Fine Sand Some Gravel Trace Silt
 Material Source Concord Municipal Airport
 Exploration B-6, 2D, 2.0' - 4.0'

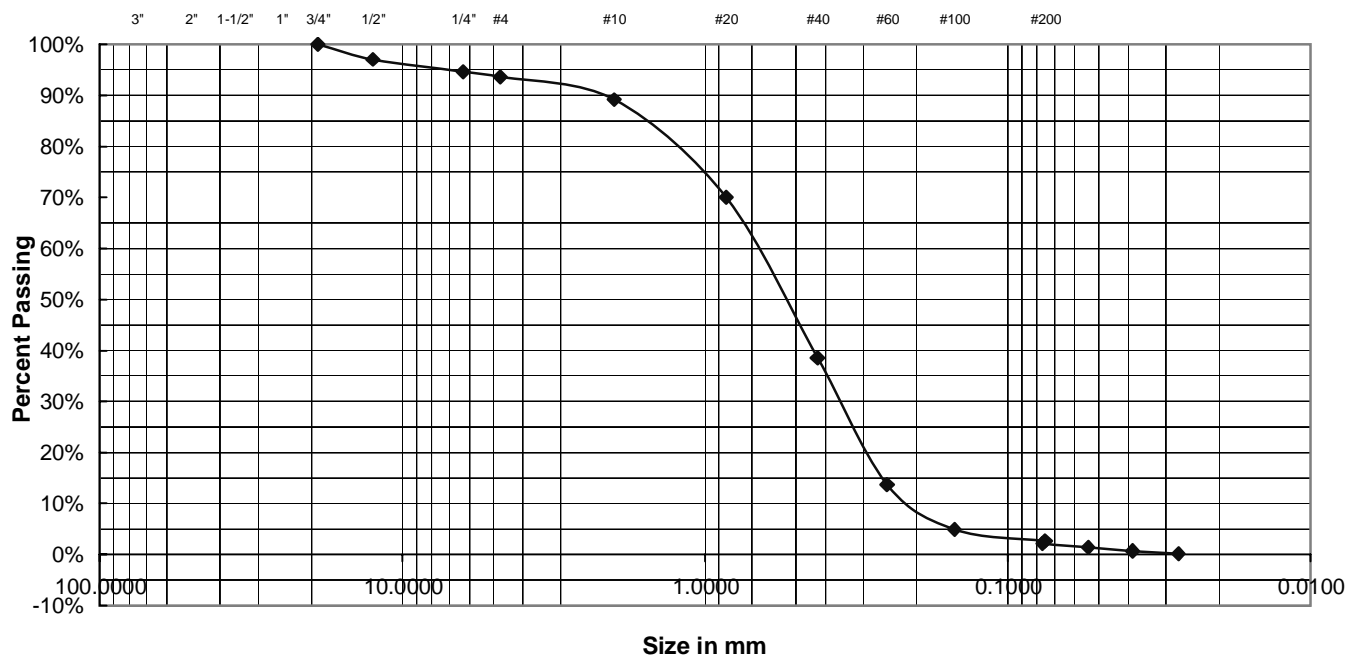
Project Number 11-0152
 Lab ID 9449S
 Date Received 3/9/2012
 Date Completed 3/15/2012
 Tested By MJS

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)
3"	75	100
2"	50	100
1-1/2"	37.5	100
1"	25	100
3/4"	19	100
1/2"	12.5	97
1/4"	6.3	95
No. 4	4.75	94
No. 10	2	89
No. 20	0.85	70
No. 40	0.425	39
No. 60	0.25	14
No. 100	0.15	5
No. 200	0.075	2.7

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.077	2.2
0.054	1.4
0.027	0.1



Particle Distribution

Gravel, retained on #4	6.4%
Sand, passing #4 and retained on #200	90.9%
Fines, 0.074 to 0.005	2.7%
Clay Fraction, <0.005	0.0%

Comments: MOISTURE CONTENT = 2.7%

Chad B. Michaud

Reviewed By



Report of Hydrometer

ASTM D-422

Project Name Concord Municipal Airport
 Client Jacobs Engineering Group, Inc.
 Material Type Coarse to Fine Sand Trace Silt and Gravel
 Material Source Concord Municipal Airport
 Exploration B-7, 3D, 4.0' - 6.0'

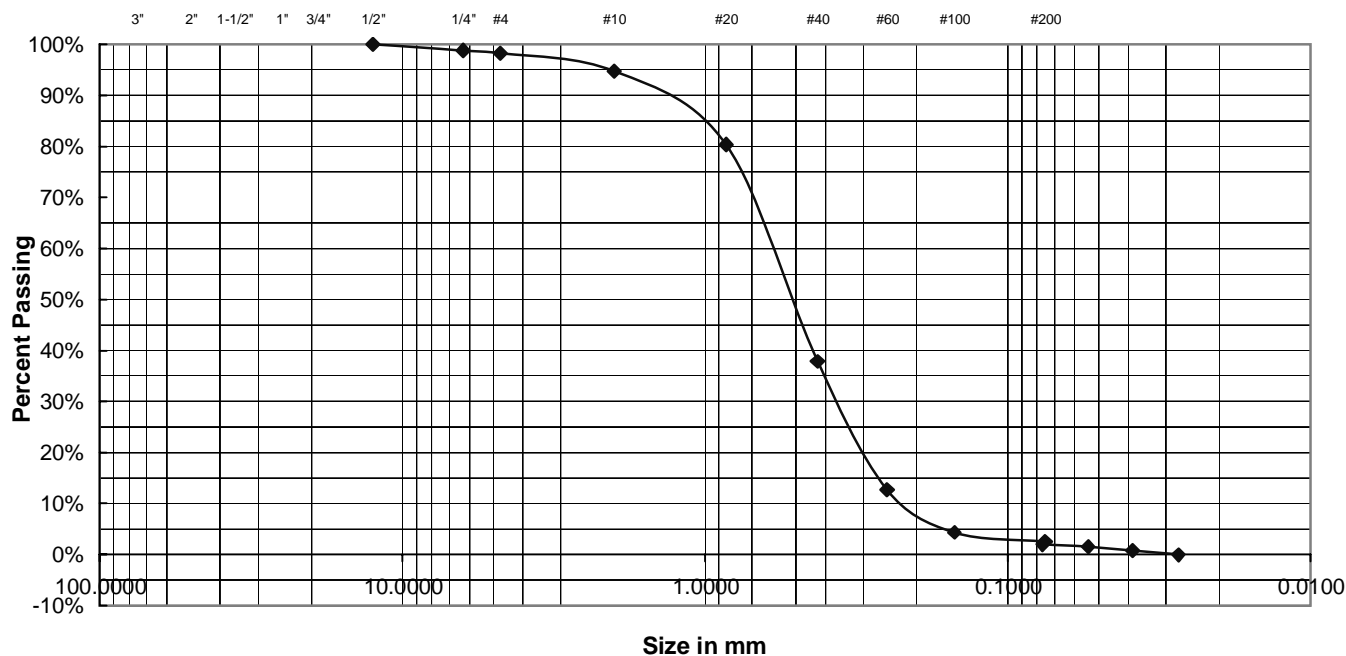
Project Number 11-0152
 Lab ID 9450S
 Date Received 3/9/2012
 Date Completed 3/16/2012
 Tested By JJR

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)
3"	75	100
2"	50	100
1-1/2"	37.5	100
1"	25	100
3/4"	19	100
1/2"	12.5	100
1/4"	6.3	99
No. 4	4.75	98
No. 10	2	95
No. 20	0.85	80
No. 40	0.425	38
No. 60	0.25	13
No. 100	0.15	4
No. 200	0.075	2.6

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.077	2.0
0.054	1.5
0.027	0.0



Particle Distribution

Gravel, retained on #4	1.7%
Sand, passing #4 and retained on #200	95.8%
Fines, 0.074 to 0.005	2.5%
Clay Fraction, <0.005	0.0%

Comments: Moisture Content = 4.1%

Chad B. Michaud

Reviewed By



Report of Hydrometer

ASTM D-422

Project Name Concord Municipal Airport
 Client Jacobs Engineering Group, Inc.
 Material Type Coarse to Fine Sand Trace Gravel and Silt
 Material Source Concord Municipal Airport
 Exploration B-8, 2D, 2.0' - 4.0'

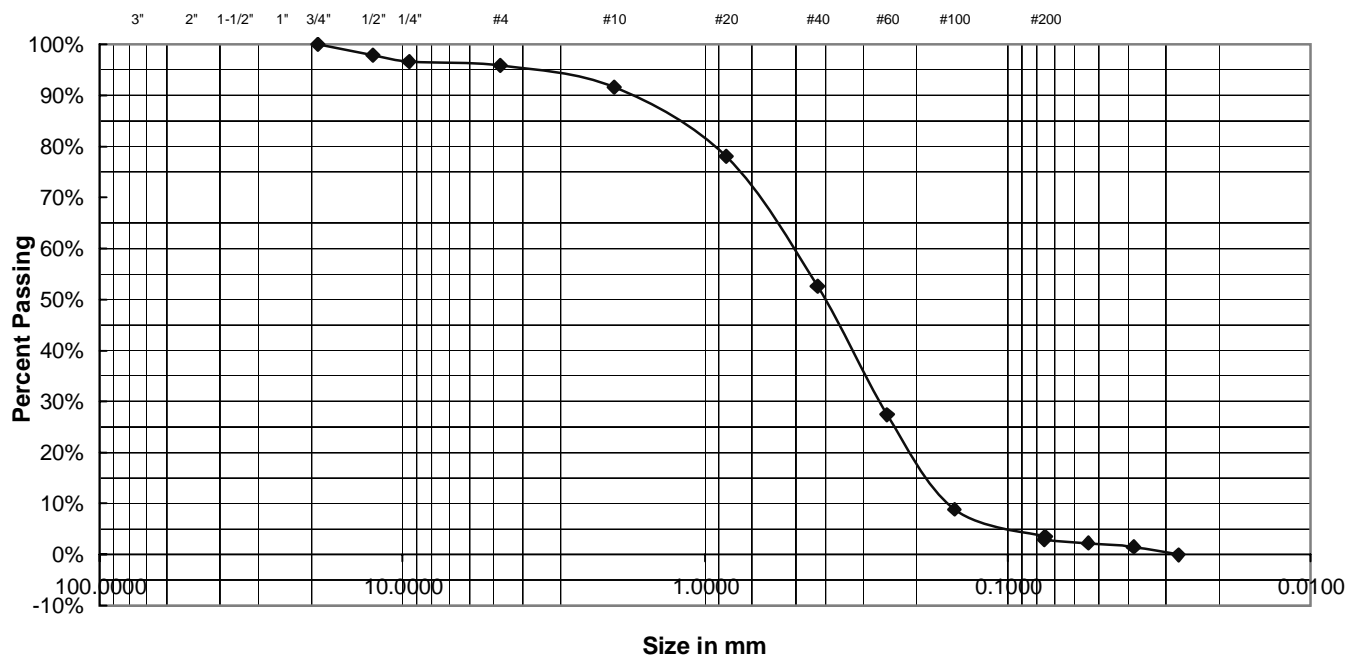
Project Number 11-0152
 Lab ID 9451S
 Date Received 3/9/2012
 Date Completed 3/15/2012
 Tested By MJS

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)
3"	75	100
2"	50	100
1-1/2"	37.5	100
1"	25	100
3/4"	19	100
1/2"	12.5	98
3/8"	9.5	97
No. 4	4.75	96
No. 10	2	92
No. 20	0.85	78
No. 40	0.425	53
No. 60	0.25	27
No. 100	0.15	9
No. 200	0.075	3.5

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.076	2.9
0.054	2.2
0.027	0.0



Particle Distribution

Gravel, retained on #4	4.1%
Sand, passing #4 and retained on #200	92.4%
Fines, 0.074 to 0.005	3.5%
Clay Fraction, <0.005	0.0%

Comments: Moisture Content = 4.6%

Chad B. Michaud

Reviewed By



Report of Hydrometer

ASTM D-422

Project Name Concord Municipal Airport
 Client Jacobs Engineering Group, Inc.
 Material Type Medium to Fine Sand Trace Silt
 Material Source Concord Municipal Airport
 Exploration B-9, 3D, 4.0' - 6.0'

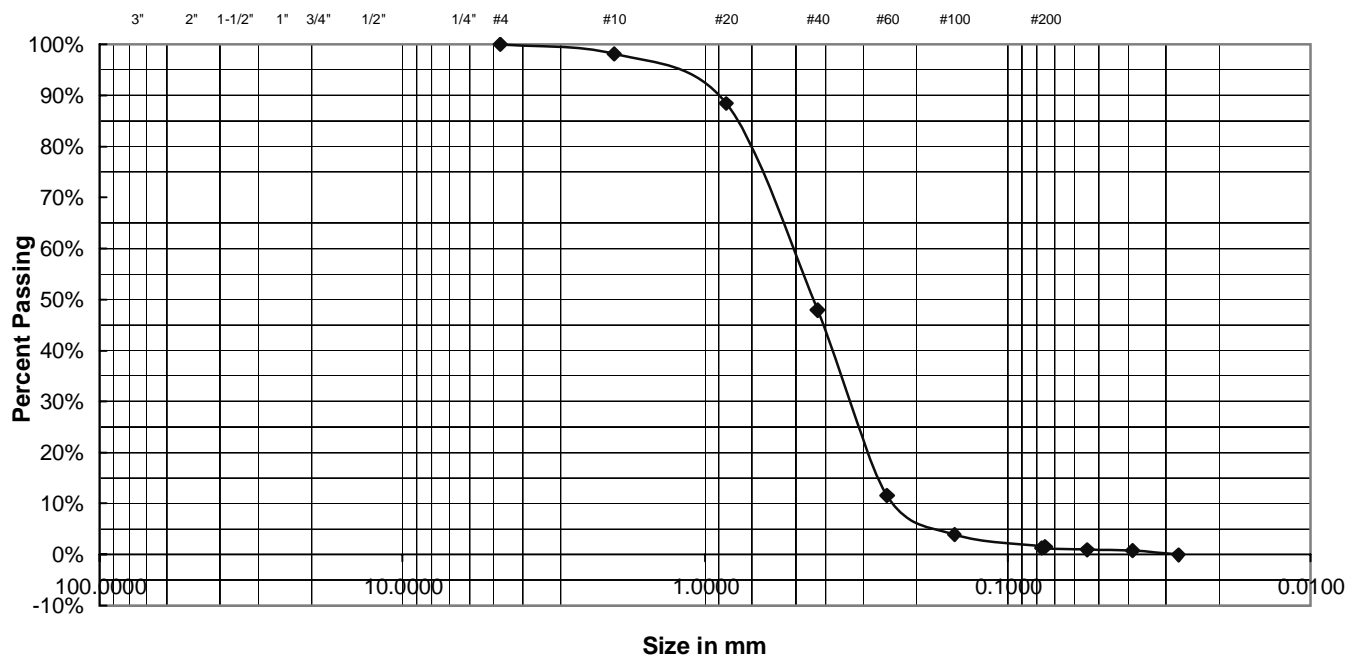
Project Number 11-0152
 Lab ID 9452S
 Date Received 3/9/2012
 Date Completed 3/16/2012
 Tested By JJR

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)
3"	75	100
2"	50	100
1-1/2"	37.5	100
1"	25	100
3/4"	19	100
1/2"	12.5	100
1/4"	6.3	100
No. 4	4.75	100
No. 10	2	98
No. 20	0.85	88
No. 40	0.425	48
No. 60	0.25	12
No. 100	0.15	4
No. 200	0.075	1.6

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.077	1.3
0.055	0.9
0.027	0.0



Particle Distribution

Gravel, retained on #4	0.0%
Sand, passing #4 and retained on #200	98.4%
Fines, 0.074 to 0.005	1.6%
Clay Fraction, <0.005	0.0%

Comments: Moisture Content = 3.8%

Chad B. Michaud

Reviewed By



Report of Hydrometer

ASTM D-422

Project Name Concord Municipal Airport
 Client Jacobs Engineering Group, Inc.
 Material Type Coarse to Fine Sand Trace Silt and Gravel
 Material Source Concord Municipal Airport
 Exploration B-10, 2D, 2.0' - 4.0'

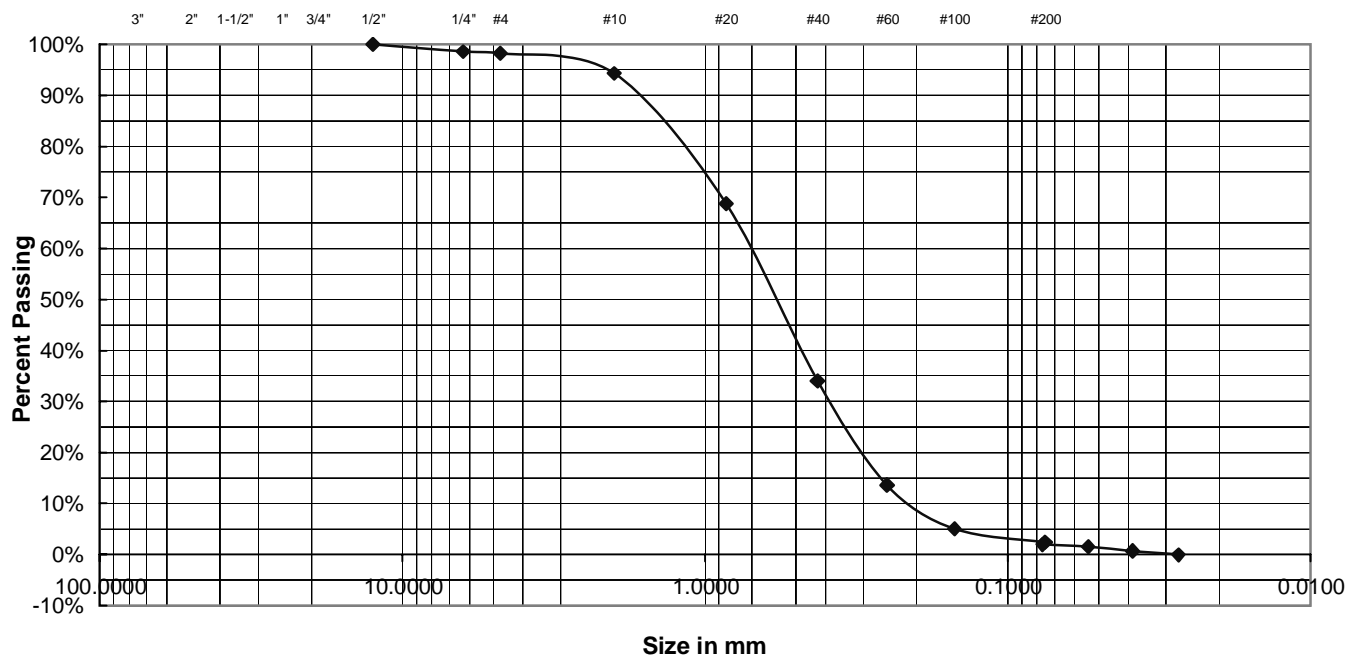
Project Number 11-0152
 Lab ID 9453S
 Date Received 3/9/2012
 Date Completed 3/16/2012
 Tested By JJR

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)
3"	75	100
2"	50	100
1-1/2"	37.5	100
1"	25	100
3/4"	19	100
1/2"	12.5	100
1/4"	6.3	99
No. 4	4.75	98
No. 10	2	94
No. 20	0.85	69
No. 40	0.425	34
No. 60	0.25	14
No. 100	0.15	5
No. 200	0.075	2.4

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.077	2.0
0.054	1.5
0.027	0.0



Particle Distribution

Gravel, retained on #4	1.8%
Sand, passing #4 and retained on #200	95.8%
Fines, 0.074 to 0.005	2.4%
Clay Fraction, <0.005	0.0%

Comments: Moisture Content = 2.9%

Chad B. Michaud

Reviewed By



Report of Hydrometer

ASTM D-422

Project Name Concord Municipal Airport
 Client Jacobs Engineering Group, Inc.
 Material Type Coarse to Fine Sand Trace Silt and Gravel
 Material Source Concord Municipal Airport
 Exploration B-11, 9D, 16.0' - 18.0'

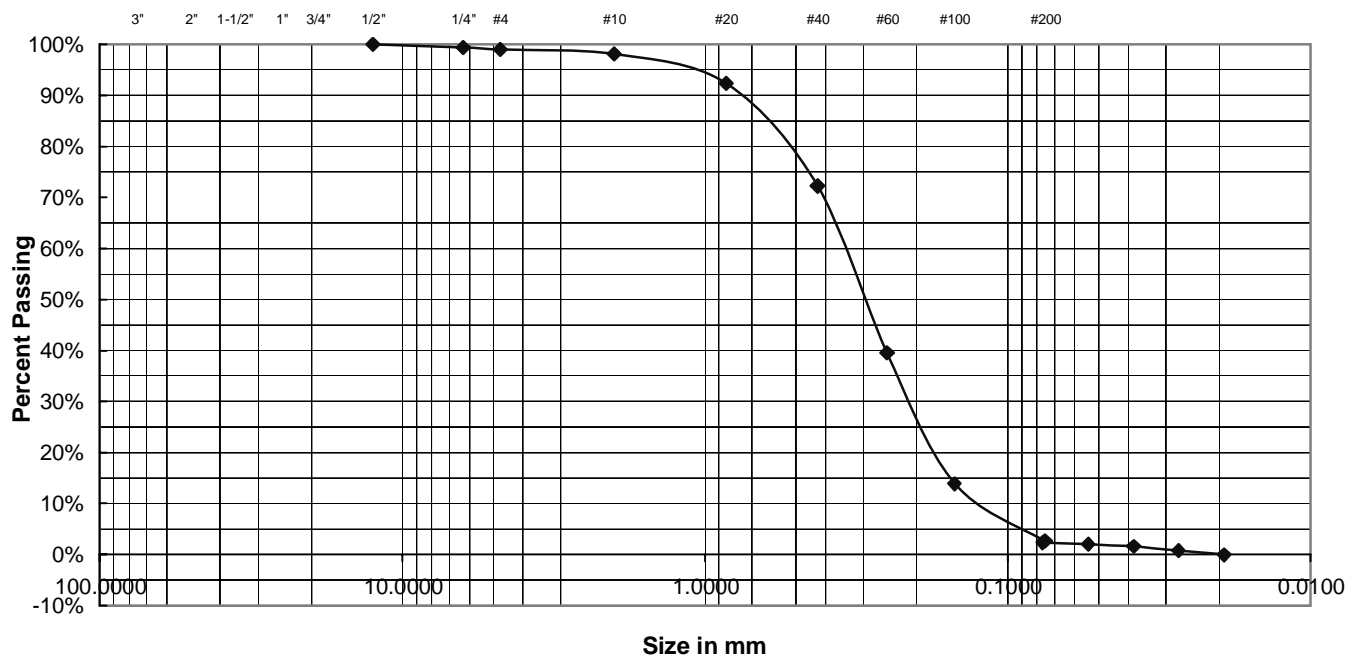
Project Number 11-0152
 Lab ID 9454S
 Date Received 3/9/2012
 Date Completed 3/16/2012
 Tested By JJR

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)
3"	75	100
2"	50	100
1-1/2"	37.5	100
1"	25	100
3/4"	19	100
1/2"	12.5	100
1/4"	6.3	99
No. 4	4.75	99
No. 10	2	98
No. 20	0.85	92
No. 40	0.425	72
No. 60	0.25	40
No. 100	0.15	14
No. 200	0.075	2.6

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.077	2.4
0.054	2.0
0.027	0.8
0.019	0.0



Particle Distribution

Gravel, retained on #4	1.0%
Sand, passing #4 and retained on #200	96.4%
Fines, 0.074 to 0.005	2.6%
Clay Fraction, <0.005	0.0%

Comments: Moisture Content = 4.7%

Chad B. Michaud

Reviewed By



Report of Hydrometer

ASTM D-422

Project Name Concord Municipal Airport
 Client Jacobs Engineering Group, Inc.
 Material Type Coarse to Fine Sand Some Silt
 Material Source Concord Municipal Airport
 Exploration B-12, 4D, 10.0' - 12.0'

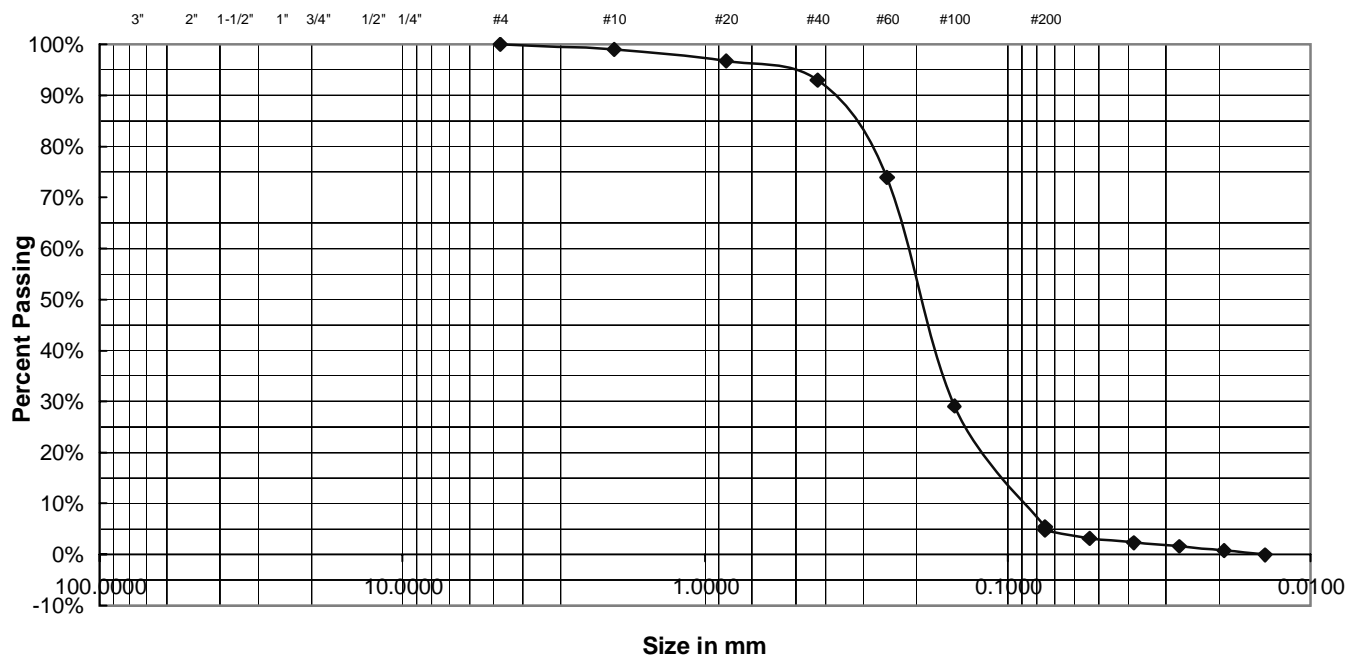
Project Number 11-0152
 Lab ID 9455S
 Date Received 3/9/2012
 Date Completed 3/15/2012
 Tested By MJS

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)
3"	75	100
2"	50	100
1-1/2"	37.5	100
1"	25	100
3/4"	19	100
1/2"	12.5	100
3/8"	9.5	100
No. 4	4.75	100
No. 10	2	99
No. 20	0.85	97
No. 40	0.425	93
No. 60	0.25	74
No. 100	0.15	29
No. 200	0.075	5.4

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.075	4.8
0.054	3.2
0.027	1.6
0.019	0.8
0.014	0.0



Particle Distribution

Gravel, retained on #4	0.0%
Sand, passing #4 and retained on #200	94.6%
Fines, 0.074 to 0.005	5.4%
Clay Fraction, <0.005	0.0%

Comments: Moisture Content = 8.1%

Chad B. Michaud

Reviewed By



Report of Hydrometer

ASTM D-422

Project Name Concord Municipal Airport
 Client Jacobs Engineering Group, Inc.
 Material Type Coarse to Fine Sand Trace Silt and Gravel
 Material Source Concord Municipal Airport
 Exploration B-13, 3D, 4.0' - 6.0'

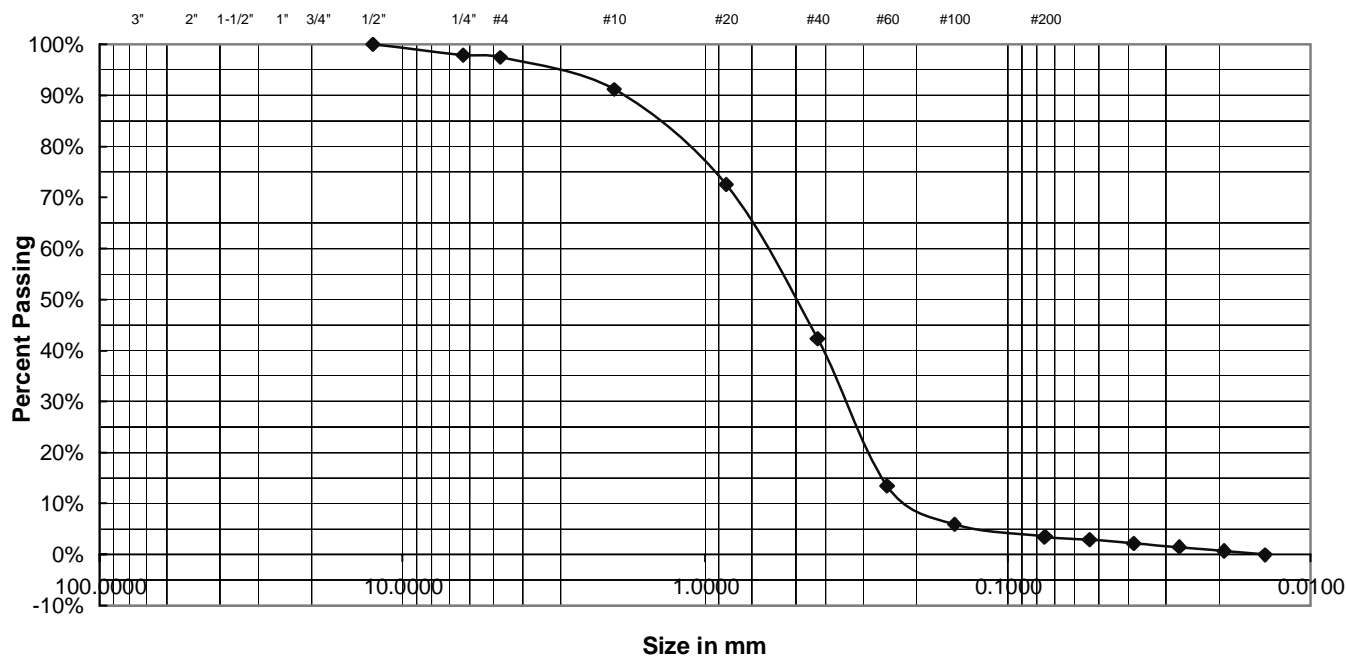
Project Number 11-0152
 Lab ID 9456S
 Date Received 3/9/2012
 Date Completed 3/16/2012
 Tested By JJR

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)
3"	75	100
2"	50	100
1-1/2"	37.5	100
1"	25	100
3/4"	19	100
1/2"	12.5	100
1/4"	6.3	98
No. 4	4.75	97
No. 10	2	91
No. 20	0.85	73
No. 40	0.425	42
No. 60	0.25	13
No. 100	0.15	6
No. 200	0.075	3.5

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.076	3.4
0.054	2.9
0.027	1.5
0.019	0.7
0.014	0.0



Particle Distribution

Gravel, retained on #4	2.6%
Sand, passing #4 and retained on #200	93.9%
Fines, 0.074 to 0.005	3.5%
Clay Fraction, <0.005	0.0%

Comments: Moisture Content = 3.4%

Chad B. Michaud

Reviewed By



Report of Hydrometer

ASTM D-422

Project Name Concord Municipal Airport
 Client Jacobs Engineering Group, Inc.
 Material Type Coarse to Fine Sand Trace Gravel and Silt
 Material Source Concord Municipal Airport
 Exploration B-14, 2D, 2.0' - 4.0'

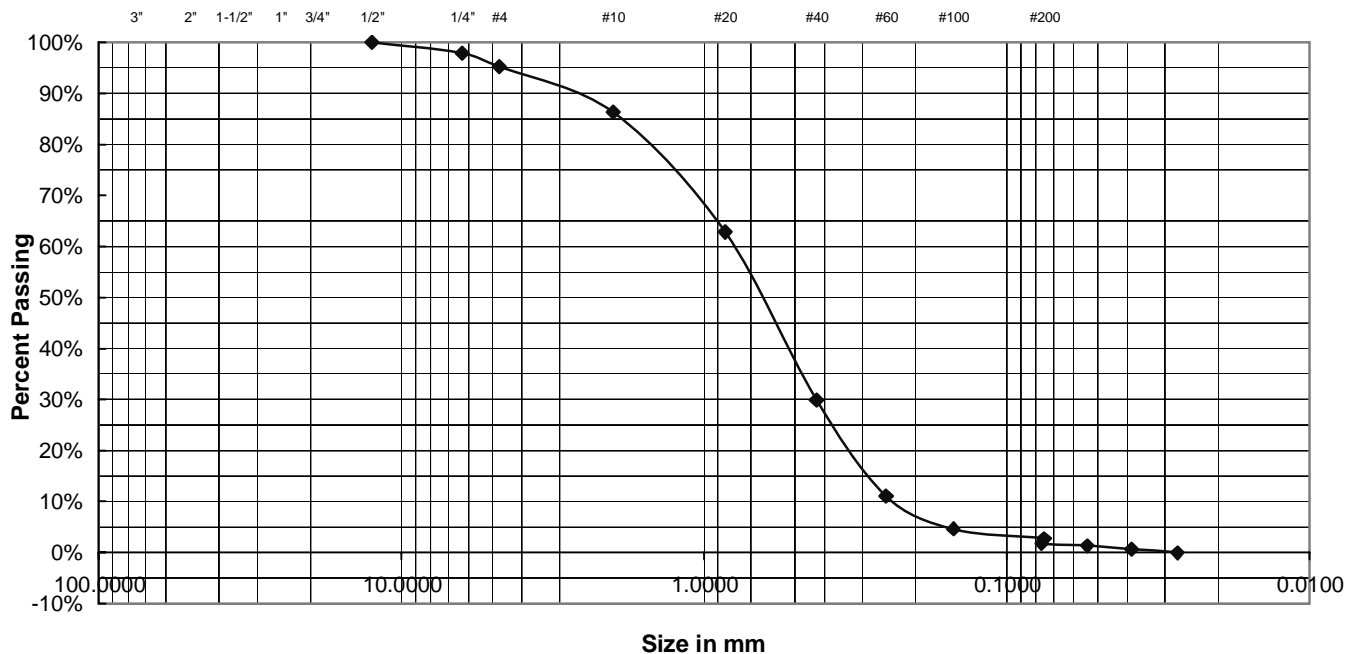
Project Number 11-0152
 Lab ID 9457S
 Date Received 3/9/2012
 Date Completed 3/16/2012
 Tested By JJR

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)
3"	75	100
2"	50	100
1-1/2"	37.5	100
1"	25	100
3/4"	19	100
1/2"	12.5	100
1/4"	6.3	98
No. 4	4.75	95
No. 10	2	86
No. 20	0.85	63
No. 40	0.425	30
No. 60	0.25	11
No. 100	0.15	5
No. 200	0.075	2.7

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.077	1.8
0.054	1.4
0.027	0.0



Particle Distribution

Gravel, retained on #4	4.8%
Sand, passing #4 and retained on #200	92.5%
Fines, 0.074 to 0.005	2.7%
Clay Fraction, <0.005	0.0%

Comments: Moisture Content = 3.5%

Chad B. Michaud

Reviewed By



Report of Hydrometer

ASTM D-422

Project Name Concord Municipal Airport
 Client Jacobs Engineering Group, Inc.
 Material Type Medium to Fine Sand Trace Silt and Gravel
 Material Source Concord Municipal Airport
 Exploration B-15, 3D, 4.0' - 6.0'

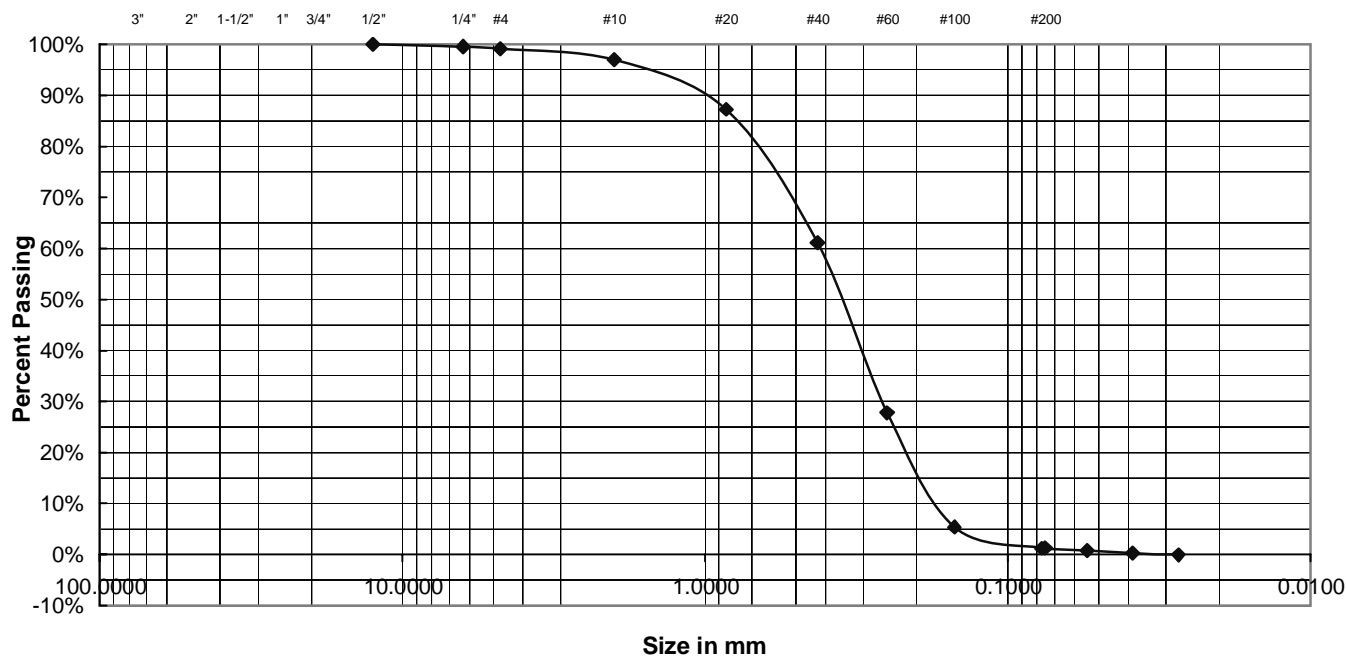
Project Number 11-0152
 Lab ID 9458S
 Date Received 3/9/2012
 Date Completed 3/16/2012
 Tested By JJR

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)
3"	75	100
2"	50	100
1-1/2"	37.5	100
1"	25	100
3/4"	19	100
1/2"	12.5	100
1/4"	6.3	100
No. 4	4.75	99
No. 10	2	97
No. 20	0.85	87
No. 40	0.425	61
No. 60	0.25	28
No. 100	0.15	5
No. 200	0.075	1.3

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.077	1.2
0.055	0.8
0.027	0.0



Particle Distribution

Gravel, retained on #4	0.9%
Sand, passing #4 and retained on #200	97.9%
Fines, 0.074 to 0.005	1.2%
Clay Fraction, <0.005	0.0%

Comments: Moisture Content = 4.1%

Chad B. Michaud

Reviewed By



Report of Hydrometer

ASTM D-422

Project Name Concord Municipal Airport
 Client Jacobs Engineering Group, Inc.
 Material Type Medium to Fine Sand Some Silt
 Material Source Concord Municipal Airport
 Exploration B-16, 2D, 2.0' - 4.0'

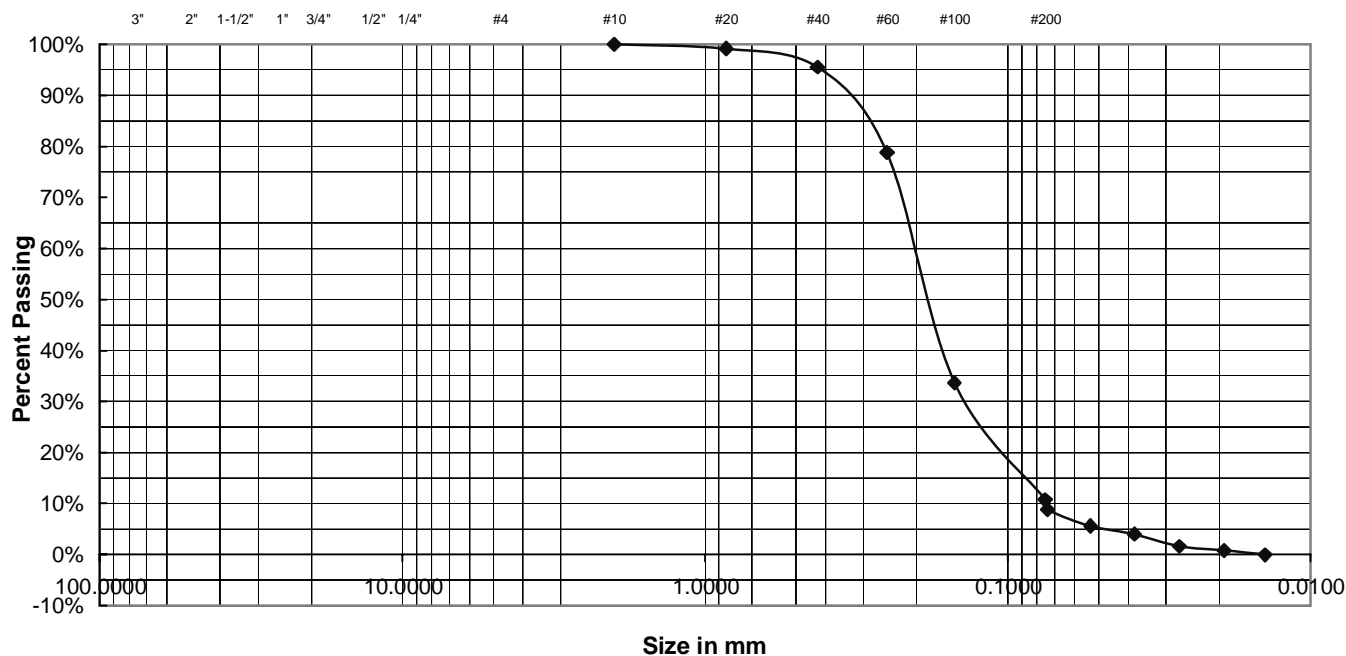
Project Number 11-0152
 Lab ID 9459S
 Date Received 3/9/2012
 Date Completed 3/15/2012
 Tested By MJS

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)
3"	75	100
2"	50	100
1-1/2"	37.5	100
1"	25	100
3/4"	19	100
1/2"	12.5	100
3/8"	9.5	100
No. 4	4.75	100
No. 10	2	100
No. 20	0.85	99
No. 40	0.425	96
No. 60	0.25	79
No. 100	0.15	34
No. 200	0.075	10.7

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.074	8.8
0.053	5.6
0.027	1.6
0.019	0.8
0.014	0.0



Particle Distribution

Gravel, retained on #4	0.0%
Sand, passing #4 and retained on #200	89.3%
Fines, 0.074 to 0.005	10.7%
Clay Fraction, <0.005	0.0%

Comments: Moisture Content = 8.1%

Chad B. Michaud

Reviewed By



Report of Hydrometer

ASTM D-422

Project Name Concord Municipal Airport
 Client Jacobs Engineering Group, Inc.
 Material Type Coarse to Fine Sand Some Gravel Trace Silt
 Material Source Concord Municipal Airport
 Exploration B-17, 2D, 2.0' - 4.0'

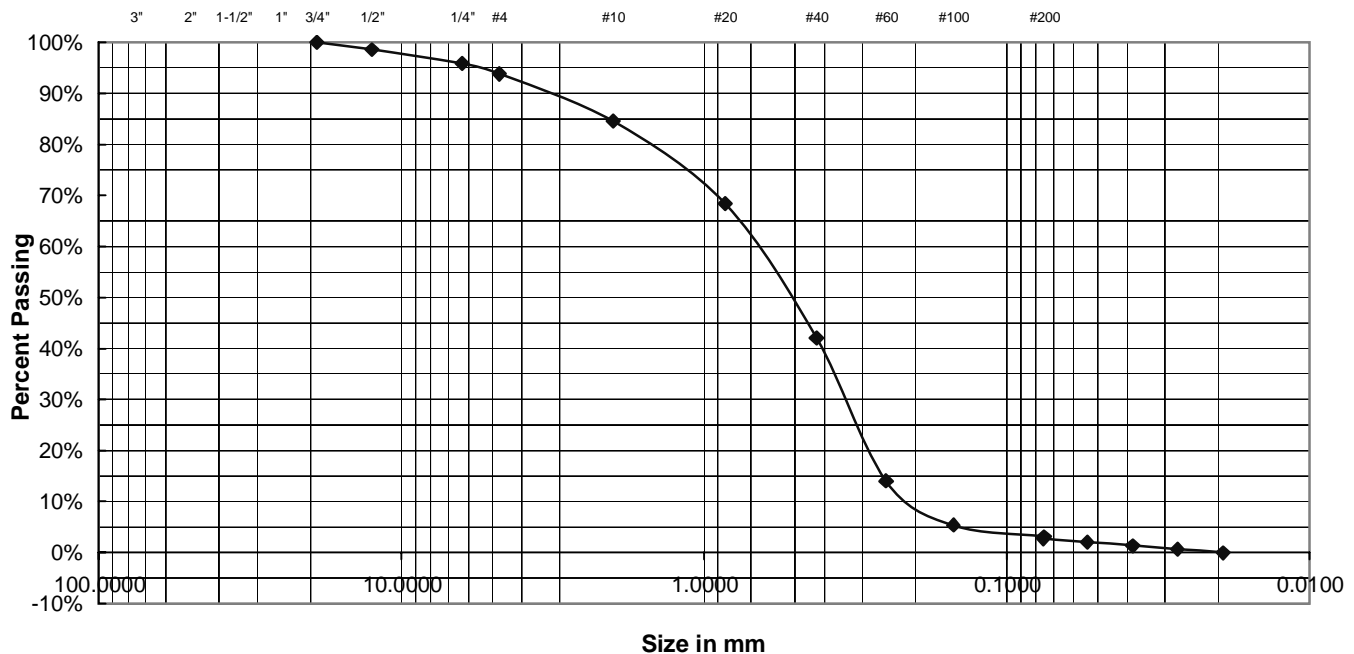
Project Number 11-0152
 Lab ID 9460S
 Date Received 3/9/2012
 Date Completed 3/16/2012
 Tested By JJR

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)
3"	75	100
2"	50	100
1-1/2"	37.5	100
1"	25	100
3/4"	19	100
1/2"	12.5	99
1/4"	6.3	96
No. 4	4.75	94
No. 10	2	85
No. 20	0.85	68
No. 40	0.425	42
No. 60	0.25	14
No. 100	0.15	5
No. 200	0.075	3.1

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.076	2.7
0.054	2.0
0.027	0.7
0.019	0.0



Particle Distribution

Gravel, retained on #4	6.2%
Sand, passing #4 and retained on #200	90.7%
Fines, 0.074 to 0.005	3.1%
Clay Fraction, <0.005	0.0%

Comments: Moisture Content = 3.7%

Chad B. Michaud

Reviewed By



Report of Hydrometer

ASTM D-422

Project Name Concord Municipal Airport
 Client Jacobs Engineering Group, Inc.
 Material Type Medium to Fine Sand Trace Silt
 Material Source Concord Municipal Airport
 Exploration B-18, 2D, 2.0' - 4.0'

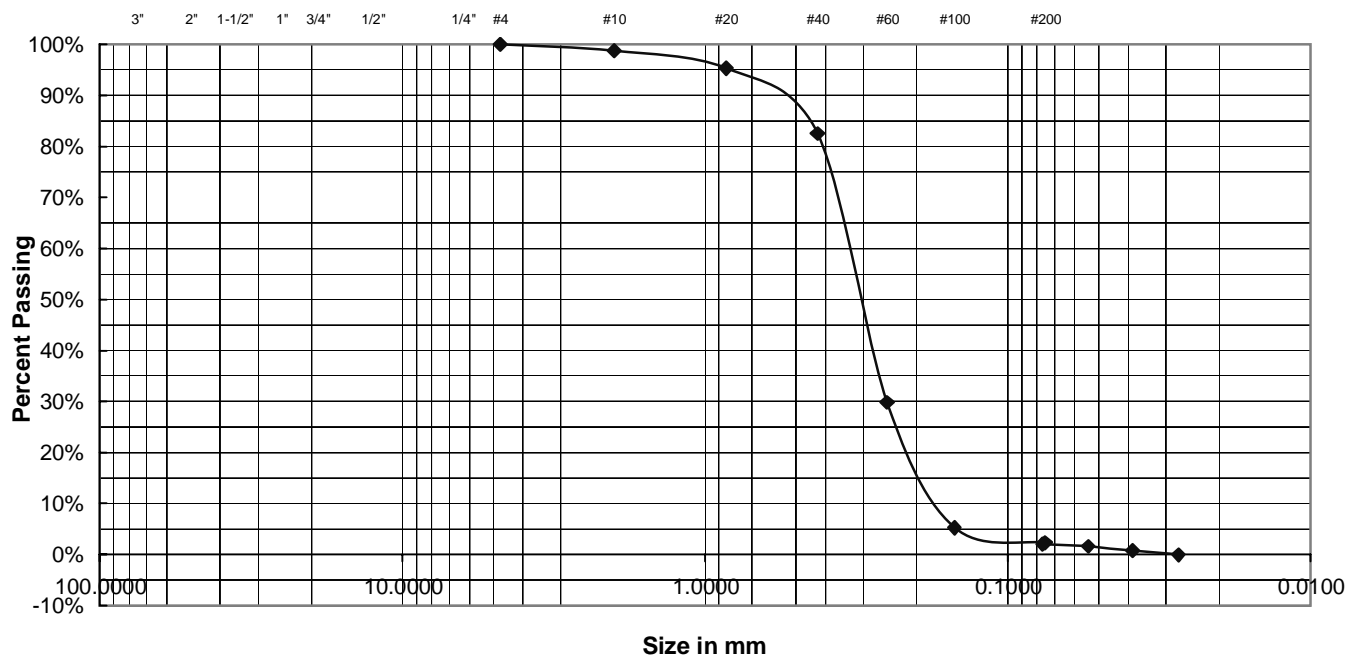
Project Number 11-0152
 Lab ID 9461S
 Date Received 3/9/2012
 Date Completed 3/16/2012
 Tested By JJR

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)
3"	75	100
2"	50	100
1-1/2"	37.5	100
1"	25	100
3/4"	19	100
1/2"	12.5	100
1/4"	6.3	100
No. 4	4.75	100
No. 10	2	99
No. 20	0.85	95
No. 40	0.425	82
No. 60	0.25	30
No. 100	0.15	5
No. 200	0.075	2.4

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.077	2.1
0.054	1.6
0.027	0.0



Particle Distribution

Gravel, retained on #4	0.0%
Sand, passing #4 and retained on #200	97.6%
Fines, 0.074 to 0.005	2.4%
Clay Fraction, <0.005	0.0%

Comments: Moisture Content = 3.2%

Chad B. Michaud

Reviewed By